The values rural households attach to forest resources and their participation in community-based forest management: the case of three communities in KwaZulu-Natal

By

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DECLARATION

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As the candidate's supervisors, we agree to the submission of this dissertation.

_____ _____

M. Mudhara (Supervisor) Date

_____ _____

E.Z. Wale (Co-supervisor) Date

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I salute you all!!!!

ABSTRACT

Community-based forest management (CBFM) offers a better strategy for controlling forest resource degradation while at the same time benefiting local communities. With few exceptions, CBFM had been largely neglected in South Africa in the past. Lately, community forestry has, however, gained impetus through changes in the programs of the Department of Water and Forestry. Despite such efforts, a preliminary survey in some districts of KwaZulu-Natal showed that only a small proportion of households were participating in CBFM. The reason behind the lack of household participation could be that the objectives of most CBFM programs were not in line with the values rural communities attach to forest resources. Some authors have recommended that understanding the values households attach to forest resources is crucial for framing strategies on implementing CBFM. This study, therefore, investigates the values households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal, in aggregate, attach to forest resources and the factors influencing households to participate in CBFM.

The social choice approach was used to measure the values households attach to forest resources. Hundred and fifty-one (151) household heads were asked to give scores of relative importance to 21 forest products and services on a 5-point Likert scale. Principal Component Analysis was used to generate composite indices or factors representing the values households attach to forest products and services. Ordinary Least Squares regression was then employed to determine the factors influencing such valuation of forests. The Multinomial Logit model was used to estimate the determinants of household position/status on participation in CBFM.

The results showed that households in the three communities, on aggregate, overwhelmingly attach anthropocentric values to forest products and services. This was interpreted to be due to the high levels of household poverty that is rampant among many rural households of South Africa. However, in addition to the anthropocentric values, rural households also attach cultural/moral/spiritual and non-use/option values to forests. No differences existed across the three communities in terms of the anthropocentric and cultural values households attach to forest. However, households in Gudwini (who were managing a natural forest) significantly attached more non-use/option values to forest. This was attributed to the fact that households in this community believed that the natural forests were their heritage and were obliged to pass them to their future generations. It was also found that the anthropocentric and cultural/moral/spiritual values households attach to forest resources influence the decision to participate in CBFM programs. Other socio-economic factors (especially those that influence household's dependency on forests and the opportunity cost of their time in managing those forests) such as gender of household head, household size, levels of household income, total amount of social grants, perception of forest degradation, access to electricity, and distance to the forests have also been found to influence the household's decision to participate in CBFM. The study recommended that, since poorer societies have more materialistic orientation towards forests, CBFM programs should target poverty alleviation/income generation as the central theme to enhance participation in CBFM. Moreover, local people who depend more on forests and those with a lower opportunity cost of their time in managing forests could be targeted to ensure sustainable CBFM programs.

TABLE OF CONTENTS

CONTENTS	PAGE
DECLARATION	i
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF APPENDICES	ix
LIST OF ACRONYMS	x
CHAPTER 1: INTRODUCTION	1
1.1 Background	1
1.2 Research problem	3
1.3 Rationale of the study	4
1.4 Objectives of the study	5
1.5 Study hypotheses	6
1.6 Scope and limitations of the study	7
1.7 Organisation of the thesis	8
CHAPTER 2: FOREST VALUE ORIENTATIONS AND PARTICIPATION IN CBFM	10
2.1 Introduction	10
2.2 Community forest management and common property regimes	10
2.3 The importance of participation in community forest management	11
2.4 Forest values and value orientations	12
2.4.1 Measurement of forest values	17
2.4.1.1 Economic approach to measure forest values 18	
2.4.1.2 Non-economic approaches to measure forest values	20
2.4.2 Forests values in South Africa	22
2.4.2.1 Direct values	23
2.4.2.2 Indirect values	24
2.4.3 Forest values and participation in CBFM	24
2.4.4 Previous studies on forest values	26
2.5 Factors influencing the values households attach to forest resources	28
2.5.1 Socio-economic factors	28
2.5.2 Perceived economic benefits and benefit distribution	31
2.5.3 Institutional factors	32

2.6 Factors influencing household decision to participate in community forest management 33
2.6.1 Perceived economic benefits 33
2.6.2 Institutional factors 34
2.6.3 Forest resource-based conflicts 36
2.6.4 Socio-economic factors 36
2.6.4.1 Household composition 37
2.6.4.2 Ethnic homogeneity 38
2.6.4.3 Poverty and income inequality 38
2.6.4.4 Gender 39
2.6.4.5 Users' attitudes and perceptions about forest resources 40
2.5.4.6 Social capital 41
2.7 Summary 42

CHAPTER 3: RESEARCH METHODOLOGY 43
3.1 Introduction 43
3.2 Methods of data collection 43
3.2.1 Study area 43
3.2.2 Sampling 45
3.2.3 Data collection instrument 47
3.3 Conceptual approach 48
3.4 Empirical methods of data analysis 51
3.4.1 Model for estimating household forest value orientations 52
3.4.2 Model for estimating household participation status 53
3.4.3 Regression model diagnostics 54
3.4.4 Description of the dependent and explanatory variables 55
3.5 Summary 58

CHAPTER 4: RESULTS AND DISCUSSIONS 59
4.1 Introduction 59
4.2 Demographic characteristics of the studied communities 59
4.3 Values households attach to forest resources 61
4.4 Factors influencing the values households attach to forest resources 67
4.4.1 Factors influencing the anthropocentric values households attach to forests 69
4.4.2 Factors influencing the cultural/moral/spiritual values households attach to forests 73
4.4.3 Factors influencing the non-use/option values households attach to forests 75
4.5 Factors influencing household decision to participate in CBFM 77
4.5.1 Goodness-of-fit of the MNL model 81
4.5.2 Values households attach to forests and participation in CBFM 85
4.5.3 Socio-economic and institutional factors affecting household participation status 88
4.5.4 Factors hindering interested and willing households from

participating 99
4.4.4 The effect of area/geographical differences on the values households attach to forests
4.6 Summary 102

CHAPRTER 5: CONCLUSIONS AND RECOMMENDATIONS 103
5.1 Conclusions 103
5.2 Policy recommendations 106
5.3 Recommendations for further research 107

REFERENCES 109

APPENDICES 121

LIST OF TABLES

Table **Page**

Table 3.1: Distribution of participating and non-participating households in the three communities studied **45**

Table 3.2: Distribution of participating and non-participating households in the sample **47**

Table 3.3: Variables used to estimate the value households attach to forest resources **56**

Table 3.4: Variables used to estimate household participation status **57**

Table 3.5: Variables used in the chi-squared test explaining short-run differences between already participating households and those interested to participate **58**

Table 4.1: Key characteristics of the study communities managing forests **60**

Table 4.2: The results of factor analysis to extract principal components **63**

Table 4.3: Dimensions of the values sampled households attach to forest resources **64**

Table 4.4: Diagnostics to assess the degree of multicolinearity **68**

Table 4.5: Results of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity **69**

Table 4.6: OLS and GLS regression results **70**

Table 4.7: Independent t-test for key continuous variables affecting household participation status **79**

Table 4.8: Chi-squared test for the difference in frequencies between dichotomous variables explaining household participation status **80**

Table 4.9: Coefficient estimates for the MNL model to estimate the factors influencing household participation status **82**

Table 4.10: Goodness-of-fit statistics for the MNL model **83**

Table 4.11: Zero-order or pair-wise correlations and VIFs used to detect multicollinearity among explanatory variables in the MNL regression **84**

Table 4.12: The chi-squared test explaining short-run differences between already participating households and those interested to participate **100**

APPENDICES

Appendix 1: The questionnaire used for data collection **121**

Appendix 2: The results of PCA (Rotated matrix) **135**

Appendix 3: Results of OLS model to determine the anthropocentric values households attach to forest resources **136**

Appendix 4: Results of OLS model to determine the cultural/moral/spiritual values households attach to forest resources **137**

Appendix 5: Results of OLS model to determine the option/non-use values households attach to forest resources **138**

LIST OF ACRONYMS

CBNRM	**: Community-based Natural Resource Management**
CBFM	**: Community-based Forest Management**
CLRM	**: Classical Linear Regression Model**
CVM	**: Contingent Valuation Method**
DWAF	**: Department of Water Affairs and Forestry**
FAO	**: Food and Agriculture Organisation of the United Nations**
MNL	**: Multinomial Logit Model**
NGO	**: Non-Governmental Organization**
OLS	**: Ordinary Least Squares Regression**
PCA	**: Principal Component Analysis**
RPT	**: Revealed Preference Techniques**
SCI-SLM	**: Stimulating Community Initiatives in Sustainable Land Management**
SPT	**: Stated Preference Techniques**
UNCED	**: United Nations Conference on Environment and Development**
WTP	**: Willingness-To-Pay**

CHAPTER 1: INTRODUCTION

1.1 Background

In South Africa, land degradation, resulting from deforestation, is a widespread problem in most communal areas (Hoffman & Todd, 2000). With few exceptions, community-based forest management (CBFM), an internationally recognised strategy to ensure sustainable use of communally owned forests, had been neglected in South Africa in the past (DWAF, 1997). The political practices of moving people from where they were settled into reserves and homelands, during apartheid, contributed to the pattern of land degradation in South Africa (Rosenberg, 2012). During the apartheid era, households in communal areas were reluctant to respond to government schemes for improving the land, including CBFM programs. Government authorities established small community plantations around natural forests to create alternative resources for the supply of firewood for households in districts where land was communally owned, especially in the former Transkei and KwaZulu. However, these government-initiated CBFM programs were unsuccessful as they were neglected by communities (DWAF, 1995).

Difficulties have continued to be encountered in sustaining CBFM programs even after the end of apartheid (DWAF, 2005). The lack of adequate community forestry programs is reflected in, amongst other things, the pervasive disparity between fuel-wood demand and production, the severe degradation of woodlands in many districts, local destruction of natural forests and the fact that few communities have been able to incorporate tree growing into their local development initiatives. Lately, community forestry has gained impetus through changes in the

programs of the Department of Water Affairs and Forestry (DWAF), the Biomass Initiative and others (DWAF, 2005).

The consensus in the wake of the United Nations Conference on Environment and Development (UNCED) suggests the implementation of sustainable development that is based on local level solutions derived from community initiatives (Ghai & Vivian, 1992). This is in recognition of the fact that local peoples' participation is crucial for sustainable development and conservation of natural resources (Mendoza & Prabhu, 2005). However, there have been many calls for the investigation of the values communities attach to natural resources as a necessary component of community-based natural resource management (CBNRM) (Borrie et al, 2002; Poteete & Welch, 2004; Uddin, 2006; Robson et al, 1996). This is mainly because users of natural resources in rural areas value resources differently due to variation in household socio-economic/demographic/cultural attributes, dependency on natural resources, existing institutional set-up and property rights regimes (Maskey et al, 2006). On the other hand, common interests or values among community members reduce conflicts over resource use and are crucial for collective action in CBNRM (Poteete & Welch, 2004). Within the context of CBNRM, high values attached to forest resources, among other factors, indicate high levels of commitment for households to participate in community-based forest management (CBFM) (Uddin, 2006). Therefore, understanding the values local communities attach to forest products and services is a critical foundation for policy decision-making to foster participation in CBFM (Borrie et al, 2002; Kumar & Kant, 2007; Kant & Lee, 2004).

Participation in management, extraction and decision-making within the user group is a key to successful collective management. The decision to participate in collective action depends upon

many socio-economic, institutional, local perceptions, knowledge and attitudinal factors and the values households attach to forest resources (Maskey et al, 2006). Hence, it is important to recognise the influence that these factors can have on community participation when defining management strategies and actions for the conservation of natural resources (Uddin, 2006). Understanding these factors can help policy makers in CBNRM to define strategies that overcome coordination problems, distributional struggles (emanating from unfair distribution of forestry benefits or restrictions) and the incentive problems associated with common pool resources (Poteete & Welch, 2004). This study, therefore, aimed to examine the values households in KwaSobabili, New Reserve B and Gudwini rural communities attach to forest resources and the factors influencing household decision to participate in CBFM programs. This is crucial in order to define management strategies and actions appropriate for CBFM programs in South Africa.

1.2 Research problem

Efforts to control natural resources degradation and encourage sustainable resource management, including those adopted at the 1992 UN Conference on Environment and Development have fallen short of expectations (Sneddon et al, 2006). There is a growing concern that traditional forest management paradigm which endorses a forest resource utilization philosophy, based on the dominance of market over non-market values, is not equitable (Tarrant et al, 2003). In Canada, Robson et al (1996) recognised the presence of a conflict within society on the values and uses of forests and the resultant lack of interest to participate in CBFM. While some households valued their forests for the timber, non-utilitarian and non-commodity values (e.g. natural beauty and carbon dioxide sequestration) were more important to some (Robson et al,

1996). Moreover, the relative importance of these forest functions is always changing due to changing level of awareness and attitudes towards natural resources. Thus, the challenge for sustainable environmental governance is to make decisions about options and choices, align these options to the inherent values and needs of society and implement them effectively through capable institutions and relevant practices (Sampford, 2002).

In South Africa, a preliminary survey by the 'Stimulating Community Initiatives in Sustainable Land Management' (SCI-SLM) project (2010) in some rural areas of KwaZulu-Natal indicated that only a few households were participating in CBFM, years after their establishment. The project identified only three communities (KwaSobabili, New Reserve B and Gudwini) that were participating in self-initiated CBFM programs in KwaZulu-Natal. According to the Department of Water and Forestry (DWAF, 2005), one of the major constraints in the management of forest resources in South Africa was that the values households attach to natural forests and woodlands were poorly understood at national, provincial and local levels.

1.3 Rationale of the study

The identification of all possible forest values and elicitation of society's preferences is crucial for framing inclusive CBFM policies aimed at achieving sustainable forest management (Kumar & Kant, 2007). Murphree (1993) argues that policy makers on CBFM cannot just assume that everyone has the same interest on the environment. Much of the controversy in environmental management is due to different constituencies valuing specific amenities differently (Kuentzel & Dennis, 1998). Moreover, recent studies on forest values are often motivated by the rapid changes in the way modern societies value forests (Webb et al, 2008).

Poor understanding of the factors influencing household decision to participate in CBFM may adversely affect the strategy adopted for organizing community participation and its sustainability (Agarwal, 2001). In South Africa, this study can strengthen internally initiated community projects by providing information on the socio-economic factors influencing community's forest value orientations that have to be considered when defining strategies for successful CBFM. The results of this study can be applied in CBNRM projects and inform policymakers by identifying the key socio-economic, institutional and governance issues affecting households' decision to participate in CBFM. Moreover, conservation organizations in South Africa may be able to assess conservation needs in local communities and focus efforts on sectors of the population that partake in the management of forest resources.

1.4 Objectives of the study

Considering the problems associated with forest values and lack of local people's participation in CBFM mentioned in section 1.2, the objectives of the study were;

- To identify the values that households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal attach to forest resources,
- To determine what socio-economic and institutional factors influence the values households attach to these forest resources, and,
- To determine whether the values households attach to forest resources, socio-economic and institutional factors influence their decision to participate in CBFM.

1.5 Study hypotheses

The hypotheses of this research were derived from field observation and literature which is extensively reviewed in Chapter 2. The hypotheses of this thesis were as follows:

- Since households in rural KwaZulu-Natal are low income households, they are more likely to have a utilitarian value orientation that emphasize on the importance of human uses and benefits of forests, including benefits to local economies, jobs from timber production, employment from outdoor recreation and tourism, commodity-related uses and benefits (such as non-timber forest products), and so on.
- The values that households attach to forest resources vary according to differences in households' socio-economic factors (e.g., household size, employment status, farming activities, household income, value of social grants, access to electricity, selling of forest products etc.) as well as the institutional arrangements in place (e.g., harvesting prohibition, source of control etc.). This is because household's socio-economic circumstances influence their dependency on forest resources while institutional factors influence the realization of the benefits from forest resources (Kiyingi & Bukenya, 2010).
- Local people, who attach more value to the products and services provided by forests, are motivated to modify their forest use practices and invest time and effort in forest conservation activities (Robson et al, 1996). Therefore, households that attach more values to forest resources are more likely to participate in CBFM programs. The degree of commitment a household may have in sustaining threatened forest ecosystems, and hence, the decision by a household to participate in CBFM programs, also depends on socio-economic factors (e.g., household size, employment status, farming activities, main sources of household income including value of social grants, number of family members

with off-farm employment and selling of forest products, access to electricity, etc.) and institutional factors (e.g., harvesting prohibition, source of control etc.) (Kiyingi & Bukenya, 2010). A description of these socio-economic and institutional explanatory variables is provided in chapter 3 (*See table 3.3 and 3.4*).

1.6 Scope and limitations of the study

The study was conducted at household level and only heads of households were interviewed for the survey. Thus, the views of other household members, which might have been different from those of the household heads, were not elicited directly. The study was a 'snapshot' reflecting the state of affairs of CBFM programs in three communities in KwaZulu-Natal. Since the outcomes of community forest management heavily depend on the institutional background (Agarwal, 2001), it is difficult to extrapolate these results to other CBFM if similar institutional settings do not exist.

The study also did not differentiate the levels of participation for households that were participating in CBFM. A household with members who only attended meetings was considered to be in the same category of participating households as one that was involved in all the forest management activities (*i.e.*, forest protection, decision making, implementation, resource mobilization etc.).

This study adopts the social choice approach to quantitatively measure the 'full' value that households attach to forest resources. Multiple forest values are closer to the concept of 'social states' (*i.e.*, measures of social welfare including commodity consumption, collective activities, resource distribution, etc) than market price or monetary value. In addition, decisions related to

CBFM are decisions of 'social choice' and are not guided by conventional benefit-cost analysis, based on monetization of all costs and benefits (Kant & Lee, 2004).

It was also assumed, in this study, that all forest products and services are equally important regardless of whether some were economic/utilitarian functions and others are non-utilitarian values. This assumption could also have had some limitations on the study since some forest functions might be more important (have more weight) to households than other functions.

1.7 Organisation of the thesis

The remainder of this thesis is divided into four chapters. The following chapter constitutes the literature review for the thesis. It reviews literature on the principles behind CBFM and the significance of participation in collective action. It also provides a discussion on forest values including economic concept of value, measurement of these forest values and the importance of understanding the values local communities attach to forests for policy regarding CBFM programs. It also reviews literature on the socio-economic and institutional factors influencing the values households attach to forest resources and their decision to participate in CBFM programs.

Chapter 3 presents the research methods adopted in this study. It explains the methods of data collection (*i.e.*, study area, sampling method, and data collection instrument) and data analysis methods (*i.e.*, conceptual framework and empirical models used). The chapter elaborates on the techniques used to identify the factors representing the values households attach to forest resources. It also presents the models used to estimate the values households attach to forest

resources and their participation status. Lastly, it provides a description of both the dependent and explanatory variables used in both models.

Chapter 4 reports and discusses the results of the study. Finally, chapter 5 provides the conclusions that were drawn from the study results. It also provides the policy recommendations on community forest management based on the findings of the study. Lastly, the chapter provides recommendations for further research that were drawn from field observations, scope and limitations of the study.

CHAPTER 2: FOREST VALUE ORIENTATIONS AND PARTICIPATION IN CBFM

2.1 Introduction

Community-based forestry management (CBFM) is the internationally recognised model in which environmentally sustainable use of natural resources is assured while benefiting local communities (Uddin, 2006). The basic concept of CBFM lies on the participatory approaches for the management of forests through a group of users (Chhetri, 2005). On the other hand, the values that users attach to forest resources are crucial for decision-making in natural resource management (Borrie et al, 2002). This chapter reviews the literature on the values households attach to forest resources and community participation in CBFM. It also reviews literature on the socio-economic and institutional factors that influence both the values households attach to forest resources and their decision to participate in CBFM.

2.2 Community forest management and common property regimes

Since the 1970's, forest resources have been depleted at an alarming rate due to mounted pressure exerted on forests as a result of population increases. In response, integrated approaches to natural resources management and livelihood improvement for sustainable development have become important approaches (Manivong & Sophathilath, 2007). Community-based forest management (CBFM) variously referred to as joint forest management, collaborative forest management or participatory forest management (PACE, 2010) has become a strategy with calls from international agencies such as the Food and Agriculture Organisation (FAO) of the United Nations, the World Bank and others for governments to foster community participation in forest and natural resources management (Obua, 2002). The term has been used to encompass any

situation in which local people exercise some control in the use of forests especially those found in their local communities (PACE, 2010).

Community-based forestry management has been adopted by many African countries as a strategy for managing common pool forest resources (PACE, 2010). Although it can result in problems (e.g., the tragedy of the commons), common property is one important way to ensure that communities have the confident expectation of long-term use of natural resources (Bruce, 1999). Forest resources share attributes with many other resource systems that makes difficult their governance and management in a sustainable manner. Common pool resources are characterized by difficult of exclusion and generate finite quantities of resource units so that one person's harvest subtracts from the quantity of resources available (Shah & Maitra, 2004). Except for forest land under private property, many aspects of forests can be considered as common pool resources. Participation in management, extraction and decision-making within the user group is one key to successful collective management of common pool resources (Maskey et al, 2006).

2.3 The importance of participation in community forest management

According to the World Bank (1994), participatory development is a process through which stakeholders influence and share control over priority setting, policy-making, resource allocation and access to public goods and services. Participatory development emerged out of the recognition of the shortcomings of top-down developmental approaches (Chhetri, 2005). Participatory forest management system involves a high degree of participation of resource users in all stages of forest management, planning, implementation, monitoring and evaluation and

also in sharing of benefits (Manivong & Sophathilath, 2007). This enhances a sense of ownership and induces local community members to be engaged actively.

Forest management includes a range of human interventions that affect forest ecosystems. These interventions include both conservation and economic activities. The economic activities of forest management include the extraction of timber and other forest products, marketing forest products, maintenance of forest property and planning forest utilization for wood production to meet user group's objectives. The conservation activities related to forest management consist of planting and replanting of various species, techniques for preventing outbreaks of fire, protecting forest resources against disease and disaster and promoting sound ecology and management practices (Thoai & Ranola, 2010). The success of a user group in performing these economic and conservation activities heavily depend on the level of participation of group members (Poteete & Welch, 2004). Participation ensures that forest functions and the resources they provide will be maintained and improved to meet present and future needs. This is because participation enhances a sense of ownership and induces local community members to be engaged actively. If this can be achieved, it may be called sustainable forest management (SFM) (PACE, 2010). Relatively higher level of participation is expected in a situation where people are more creative and voluntarily involved in designing programs based on their own needs (Chhetri, 2005).

2.4 Forest values and value orientations

Values are culturally and emotionally informed beliefs about desirable standards for judging appropriate actions and goals (Tindall, 2003). They are higher, more stable, and more enduring forms of public judgment that reflects the individual's ideals and goals (Owen et al, 2009). They are more enduring conceptions of the good and desired human conditions. Values are a product

of assigning relative importance that lead agents to regard some goals or ends as more legitimate or correct and other goals as illegitimate or wrong (Borrie et al, 2002).

Forest values are those beliefs that represent an individual's orientation toward forests (Harshaw & Tindall, 2005). They are relatively enduring concepts of what is good and desirable about forests, or conversely bad and undesirable (Bengtson, 1994). However, with regards to forests, the term value can be used in several distinct ways. In one sense, the value of forests relates to the functions or purposes forests have in human use (forest functions). For example, timber, clean water and recreation are values provided by forests. In another sense, forest values denote the scales, or standards used for specific judgments in decision making and are the basis of criteria used to evaluate management practices (Gamborg & Rune, 2004).

Ecologists and economists also use the term 'value' in two different ways when referring to environmental services and ecosystems. Ecologists typically use the term to mean 'that which is desirable or worth of esteem for its own sake' (Freeman, 2003:6). According to economists, the economic value of a resource or environment systems resides in the contributions that the ecosystem functions and services make to human well-being (Freeman, 2003). Economic value of ecosystems is a measure of how important ecosystem services are or what they are worth to people (Nasi et al, 2002). It is a measure of what the maximum amount an individual is willing to forego in other goods and services in order to obtain some good or service. The total benefits that people feel they derive from the existence and use of forests refers to the total economic value (TEV). The total economic value expresses the total value of each resource unit (environmental good or service) that incorporates the value of the different attributes of the resource. It is the

sum of the component values that range from direct use, indirect use and option values, to nonuse values such as bequest and existence values (Zaccagnini et al, 2001).

Thus, the conceptualization of the term 'value' varies across disciplines. In general, two categories of values include held values (*i.e.*, modes of conduct, ethical principles, or end states) and assigned values (the relative worth of an object or the economic value) (Owen et al, 2009). In this study, following the two categories of values by Owen et al (2009), the value of a forest product or service (e.g. firewood) refers to the worth of that product or service to that household (*i.e.*, assigned values). This was measured using the five-point likert scale, in this study. On the other hand, the values households attach to forest resources refer to the forest value orientations. These represent the held forest values and were generated as factors using principal component analysis.

The values households hold towards forest (i.e., held forests values or forest value orientations) are patterns of basic beliefs that strengthen and give meaning to fundamental values (Berninger & Kneeshaw, 2009). An individual's value orientations are an expression of basic beliefs providing a foundation for higher order cognitions, such as attitudes and norms (Li et al, 2010). Understanding people's forest value orientations can help policy makers predict local users' intentions to manage forest resources and establish appropriate policies (Li et al, 2010; Berninger & Kneeshaw, 2009). The influence of values on normative beliefs occurs indirectly via other components in the cognitive hierarchy. For example, basic beliefs serve to strengthen and give meaning to fundamental values. Patterns of these basic beliefs create value orientations (Vaske et al, 2001). Value orientations constitute an expression of basic values and are revealed through the pattern and direction of basic beliefs held by an individual (Li et al, 2010).

Many studies have identified values and value categories or oreintations associated with forests. Categories of held values often include two divisions (*i.e.*, instrumental and non-instrumental, material and non-material and anthropocentric and bio-centric) (Bengston & Xu, 1995). According to Vaske et al (2001), value orientations toward natural resources including forests can be arrayed along a continuum scale ranging from anthropocentric/material/instrumental on one end to non-instrumental/non-material/bio-centric on the other. The midpoint of this scale represents a mixture of the two extremes. Thus, anthropocentric/material/instrumental and non-instrumental/non-material/bio-centric value orientations, are not mutually exclusive (Vaske et al, 2001). An anthropocentric/material/instrumental value orientation represents a human-centred view that assumes that providing for human uses and benefits is the primary aim of natural resource allocation and management. There is no notion that the non-utility functions of forest are important in their own right or for their own sake (Vaske et al, 2001). Values frequently associated with human-oriented use and sustenance categories (instrumental, material, and anthropocentric) include economic, ecological and recreational values (Vaske et al, 2001).

In contrast, a non-instrumental/non-material/bio-centric value orientation is a nature-centred view (Eckersley, 1992 cited by Owen et al, 2001). Ecosystems, species, and natural organisms are elevated to centre stage. This approach assumes that environmental objects have inherent as well as instrumental worth and that human economic uses and benefits are not necessarily the most important uses of natural resources. Values typically associated with non-use categories (non-instrumental, non-material and bio-centric) include aesthetic, cultural, spiritual, educational and ethical values (Owen et al, 2009). A more bio-centric world view accepts intrinsic values in the natural world, independent of utilitarian or direct human value endowment. Spiritual,

aesthetic, and non-consumptive nature values (e.g., non-use and option values) are important at this (more bio-centric) end of the value spectrum. This can evolve to a recognition and celebration that other species and our shared habitats have intrinsic worth or value similar to humans (Bengston et al, 2004). Expressions of this value orientation often involve general discussion of the ecological value of forest ecosystems, discussion of the importance of life-supporting ecological services provided by forests (e.g., carbon sequestration, wildlife habitat), or warnings of the environmental costs of over-exploitation of forests.

According to Li et al (2010), four types of environmental value orientations are identified as predictors of people's attitudes toward forest resources in literature. These include utilitarian, ecology, sentiment, and negativity. A utilitarian value orientation refers to viewing the main function of forests as providing commodity benefits. An ecology value orientation constitutes a nature-centred perspective emphasizing environmental preservation and ecosystem maintenance (Vaske et al, 2001). Utilitarian and ecology value orientations can be formed on a continuum that is used to examine people's attitudes related to environmental management. The literature suggests that throughout human history, changing political, economic, and socio-cultural circumstances have made people's environmental value orientations grow less utilitarian and more ecological (Bengston et al, 2004;Webb et al, 2008; Li et al, 2010).

Forests are perceived in a different way as people's values change over time (Robson et al, 1996). In the United States and other developed countries, forest values of growing importance include amenity values, recreational values as well as aesthetic and spiritual values (Gamborg & Rune, 2004). Factors cited as contributing to this change include a society less directly dependent

on natural resource, a more urbanized public with increasing recreational and aesthetic values, increasing environmental degradation and the environmental movement (Owen et al, 2009).

2.4.1 Measurement of forest values

Some forest values are more easily identified and measured than others. For forest values that are traded in the market place there is little dispute because goods and services are exchanged in markets using an agreed upon scale of relative worth (Robson et al, 1996). However, the lack of markets for non-economic or non-utilitarian values (ecological, cultural and moral values) leads to a variety of problems such as:

- difficulty to understand how they change in relative importance over time.
- difficulty to understand how they are distributed from person to person and across society.
- difficulty to measure their relative worth *i.e.*, values that are measured monetarily.
- difficulty to understand how policy changes and actions affect these values and whether such changes are socially optimal (Robson et al, 1996).

According to Borrie et al (2002), there are basically three principal approaches to measure forest values. These include the economic approach, social-psychological approach for measuring broad-based values and inference of values from attitude, preference and behavior measures. The fourth approach, the qualitative assessment of ethics, is not strictly empirically based (Borrie et al, 2002). Non-economic approaches of valuation, such as the ecological valuation of forest resources, have also gained importance as a result of increased emphasis on environmental

values and those of conservation (Averill et al, 1998). Thus, each approach measures and emphasizes different aspects of forest values.

2.4.1.1 Economic approach to measure forest values

The economic approach uses the market values of goods and services traded in markets and also attempts to assign monetary values to objects not typically traded in the market such as scenic beauty and water quality (Owen et al, 2009). Common economic valuation methods for services not traded in markets include revealed preference techniques (RPT) (*i.e.*, travel cost methods, hedonic pricing, and residual value method) and stated preference techniques (SPT) (*i.e.*, contingent valuation methods (CVM) and choice experiments (CE)) (Kant & Lee, 2004). The main strength of economic valuation approaches is that it is easier to include assigned value information (*i.e.*, dollars or numbers) into standard decision-making processes such as cost-benefit analysis (Owen et al, 2009). However, the economic approach has been criticized and its applicability to many environmental contexts is uncertain. The main weakness relates to the difficulty of capturing people's full range of values, including held and intrinsic values. Trainor & Norgaard (1999) questioned the comprehensiveness of using the economic approach to value less tangible, non-utilitarian values such as spiritual, existence, intrinsic and symbolic values. While prices and other monetary measures are indicators of assigned values, existence values do not appear to be bounded relative to other values. Moreover, moral and ethical values are not appropriately valued through trading or purchasing metaphors (Owen et al, 2009). In addition, these methods are subject to various conceptual limitations (Kumar & Kant, 2007). Economic approaches to valuing nature only measure benefits and costs in terms of human use and abuse.

However, a true moral position cannot be bought off in exchange for something of instrumental value (Owen et al, 2009).

The economic approach frequently uses the willingness-to-pay or contingent valuation measures to estimate benefits and net values of resources (Borrie et al, 2002). According to Popoola & Ajewole (2002) the willingness-to-pay (WTP) or contingent valuation is the only method generally recognised as being able to capture the general public's total economic values (*i.e.*, use and non-use values) for forest products and services. The contingent valuation method (CVM) involves asking people to directly state their values, rather than inferring values from actual choices, as the revealed preference methods do. The fact that CVM is based on what people say they would do, as opposed to what people are observed to do, is the source of its greatest weaknesses (King & Mazzotta, 2000). The CVM, thus, imposes unrealistic cognitive demands upon respondents (Gregory et al, 1993). The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature (King & Mazzotta, 2000). In addition to the above mentioned problems, the studied communities perceived that environmental goods and services were from God and could not be paid for. One of the limitations of the CVM is that respondents might not be willing to pay either due to 'protest' or because they don't have the money to pay. As a result, the CVM was less preferred to the social choice approach to assess the values households attach to forest resources.

2.4.1.2 Non-economic approaches to measure forest values

Interpretive approaches used to measure forest values aim to understand how people construct their values within the context of their place in society (O'Brien, 2003). Common techniques used in interpretive approaches include qualitative and quantitative methods, such as focus groups, in-depth dialogues and multi-attribute elicitations (Gregory, 1999). On the other hand, the socio-psychological approach is based on the fact that environmental concerns and in particular, attitudes towards environmental issues, are rooted in more stable and relatively enduring value orientations. The approach seeks to measure the broad value orientations that underlie attitudes and behavior (Borrie et al, 2002).

Application of conventional cost-benefit analysis, based on monetization of all costs and benefits, therefore, cannot account for the basic features of different forest values (Owen et al, 2009). In fact, multiple forest values are closer to the concept of social states (*i.e.*, measures of social welfare including commodity consumption, collective activities, resource distribution, etc) than the concept of monetary value. Decisions related to sustainable forest management (SFM) are decisions of social choice, based on social preferences for different social states. Based on this reasoning the appropriate decision tool to measure the values society attach to forest resources is a social choice approach to value forest resources. This is because the social choice approach addresses the main challenge associated with determining the social welfare maximizing state of the forest that offers diverse forest values as per the preferences of different stakeholders (Kumar & Kant, 2007).

The social choice theory is a theoretical framework for measuring individual interests, values or welfares as an aggregate towards collective decision (Roberts, 1980). It can be used to

understand and systematically measure the relative importance of peoples' values (Paterson & Randal, 1994, cited by Kumar & Kant, 2007). This information can help policy makers in CBFM to establish and justify appropriate objectives and define broad strategic guidelines within which sustainable community forest management is practiced. Social science research on the public values of forest can help policy makers predict how people will react to different forestry management strategies. This information helps managers better integrate utilitarian objectives and non-utilitarian forest values (Borrie et al, 2002). Social science research can help to clarify the value systems of groups of forest stakeholders and thereby facilitate the resolution of forest conflicts (Robson et al, 1996). The social choice approach employed in this study can be found within the context of social science research, searching for the broad value orientations specific to forest resources.

According to Kumar & Kant (2007), the four main steps for application of the social choice approach in the context of sustainable forest management are:

- Identification of all possible forest values relevant to forest management decisions;
- Elicitation of preferences, for different forest values, of the members of different stakeholder groups;
- Intra-group aggregation of preferences; and
- Inter-group aggregation of preferences.

In this study, the identification of all possible forest values relevant to the three communities of KwaZulu-Natal was done based on studies by Bengston et al (1999), Geldenhuys (1999), Ngcobo (2002), Owen et al (2009) and SCI-SLM (2010) preliminary survey. The household preferences for the twenty-one different forest values that were identified, was elicitated by

asking household heads to rate these forest function on a five-point likert scale. In other studies including Kumar & Kant (2007) and Kant and Lee (2004), the aggregation of forest values was done using hierarchical clustering in several stages. However, this study uses principal component analysis to aggregate the household preferences and this was one of the contributions of this study to the body of knowledge on identification of society's forest values. This study used principal component analysis mainly because of the advantage that it directly generates factors or indices that quantitatively represent the values households attach to forests.

Despite there being different approaches to assess forest values, the argument is that capturing the 'full' or 'true' value of forests is crucial in order to get a better basis for policy and management decisions. The 'full' value of forests is important for deciding what to preserve and how to prioritize when nature conservation as well as economic development objectives are pursued (Gamborg & Rune, 2004). Since the social choice approach incorporates both the market and non-market values, it better approximate the values society at large attach to forest resources.

2.4.2 Forests values in South Africa

South Africa has extensive and valuable forest resources. The forests are valued for their biological diversity, medicinal uses, aesthetic and spiritual values (Ngcobo, 2002). The direct and indirect values of the South African forests have been recognized by some authors (e.g., Dovie et al., 2002; Dovie, 2003; Dube, 2010; Geldenhuys, 1999; Mogaka, 2001; Ngcobo, 2002; Shackleton & Shackleton, 2003; Shackleton & Shackleton, 2006; Shackleton et al., 2007; Shackleton, 2009; and Twine et al., 2003).

2.4.2.1 Direct values

In South Africa, poor rural households depend on forests for their livelihoods and this account for the single largest forest value (Dube, 2010). Trees of selected species are harvested for building and for furniture. Pines, eucalyptus and wattle plantations provide most of the structural timber needs of South Africa. Despite massive improvements in the provision of electricity, most rural and a significant proportion of urban South Africans continue to use fuelwood as a key energy source for cooking (Shackleton, 2009). Traditional medicines are important to rural communities and also remain important to the rapidly growing urban black population for medical, psychosomatic and economic reasons (Ngcobo, 2002). Popular species of traditional medicinal value include *Cassipourea malosana, Erythrophleum lasianthum, Ocotea bullata* and *Warburgia salutaris* (Mogaka, 2001). According to Mogaka (2001), the use of forest-based traditional medicines has generated a local and countrywide multimillion Rand annual trade between rural source areas and urban markets.

Edible fruits, mushrooms and wild spinaches provide important dietary supplements to people in rural areas of South Africa. They provide nutrients that are deficient in their starchy staple diet. This role is even more important during drought periods, particularly in less productive agricultural areas (Ngcobo, 2002). Forests have cultural importance as burial sites. Examples are the Thathe forest of the Vhavenda and the burial site of the Zulu Chief Dingaan in Hlatikulu Forest (Geldenhuys, 1999). A survey by SCI-SLIM (2010) also indicated that in Bergiville and Ntabamhlope areas of KwaZulu-Natal, burial logs were one of the most important values of forests. Forests have an increasingly important role in providing the recreation and aesthetics needs of the growing urbanized societies. South Africa has many picnic sites, camping sites,

viewpoints, hiking trails and forest walks. The availability of such amenities is important in the tourism industry and in conservation education (Geldunhuys, 1999). Although most of these forest functions have been established in South Africa, the forest value orientations (values households attach on forest functions) to the society, who participate in managing those forests have not been established and this was the purpose this study.

2.4.2.2 Indirect values

It is recognized among many rural South Africans that the presence of vegetation can prevent soil erosion and drifts in coastal and inland areas. In terms of fauna and flora, South African forests are amongst the richest biomes and are important in maintaining genetic diversity. Thus, preservation of plants is important because they may still have important utility in order to allow experimentation and research in the future (Geldenhuys, 1999). On the other hand, the South African community benefits from forest services such as carbon storage and biodiversity protection (Dube, 2010). Forest ecosystem services, such as watershed catchment protection, erosion control, nutrient cycling, maintenance of soil fertility and local and global climate control also have a high and largely unrecorded, economic values (Mogaka, 2001). Although all these authors recognized these important societal functions of the forests, the society might not attach much value on some forest functions leading to conflicts in forest use options and lack of participation in CBFM programs.

2.4.3 Forest values and participation in CBFM

If local people attach more values on the products and services provided by forests, they will be motivated to modify their resource and land use practices and to invest time and effort in forest

conservation activities (Robson et al, 1996). Thus, forest values are a critical foundation for decision-making and a better knowledge of divergent public values can help policy makers on environmental management understand the range of perspectives they should expect among the public as well as identify possible shared values they can build upon in forging consensus (Borrie et al, 2002). Forest values indicate the benefits that people feel they derive from the existence and use of forests (Bright & Stinchfield, 2005). The economic, social and religious significance of the forest to local groups reveals the degree of commitment they may have in sustaining these threatened ecosystems through local participation (Borrie et al, 2002).

Much of the controversy in environmental management is due to different constituencies valuing specific amenities differently (Kuentzel & Dennis, 1998). Many natural resource problems are as much value-based as they are fact-based and policy makers cannot afford to ignore the different value orientations in decision-making (Borrie et al, 2002). According to Bengston (1994), the main challenge facing policy makers dealing with public forest is being responsive to diverse and changing forest values. A forest can be used in a variety of ways such that conflicts concerning the way it should be used are expected. Some may feel that the forest should predominantly be used for timber production, while others may believe that preservation is most important. Such diverging views create conflicts of interest among different groups in society and hence, unwillingness by other groups to participate in CBFM (Nordlund & Westin, 2011).

Forest managers have traditionally identified the values that people attach to forests through the economic and political systems. However, neither system is effective in expressing the 'full' nor 'true' forest value(s) (Robson et al, 2000). Despite the impacts forest decisions have on people, their non-market or non-commodity values have received little attention (Robson et al, 2000). To

be socially sustainable, traditional forest management needs to move from its narrow focus on economic/commodity objectives and incorporate a wider range of values and needs such as environmental quality, ecological, cultural and spiritual values into forest management (Robson et al, 2000). However, according to Gibson & Koontz (1998) values alone within a community are not sufficient to protect natural resources in most empirical settings. Even in the case where strongly-held beliefs about the importance of natural resources and community-based decision making exist, individuals do not always succeed in constructing institutions that provide incentives to use resources sustainably (Gibson & Koontz, 1998). This study, therefore, uses the factors generated from PCA (*i.e.*, quantitatively representing the values households attach to forests) as explanatory variables in the MNL model to investigate whether the values households attach to forest resources influenced their decision to participate in CBFM. This was the other main contribution of this study to the body of knowledge on CBFM.

2.4.4 Previous studies on forest values

Several studies on forest values in the developed countries have overwhelmingly shown that the public values non-commodity benefits of forests more than economic benefits (Bright & Stinchfield, 2005). In a study by Manning et al (1999), aesthetic and ecological values were found to be more important in forest management while economic, spiritual and intellectual values were least important. In a similar study, Tarrant et al (2003) reported that clean air and scenic beauty were the most important forest values among the US public, while wood production was the least important. Webb & Fan (2004) cited by Bright & Stinchfield (2005) conducted content analysis of newspapers, forestry journals and environmental magazines which revealed that commodity-related forest values in the United States, declined in importance while

recreation values increased from the early 1980s to 2001. In addition to utilitarian values, in the last few decades, new kinds of preference-based values, such as existence or bequest values, have been suggested in an attempt to assess the full or true value of a forest. However, in rural South Africa, several studies have reported that indigenous forests and savannas, along with plantation forests, offer numerous commodity/use benefits to rural communities and society at large (Dovie et al, 2002; Dovie, 2003; Shackleton & Shackleton, 2006; Shackleton & Shackleton, 2003; Shackleton, 2009; Shackleton et al, 2007; Twine et al, 2003). This has been attributed to the fact that in some provinces, for example in Limpopo, the use and dependency on natural forest resources, is extensive (Twine et al, 2003). Other studies have attributed the dependency on forest resources to poverty among rural households (Twine et al, 2003; Delali et al, 2007; Dovie et al, 2002; Dovie, 2003; Shackleton & Shackleton, 2003 and Shackleton & Shackleton, 2006). Despite forests being important in providing commodity values, other studies in rural South Africa have reported the significance of cultural values of forest products and services (Cocks et al, 2006: Cocks et al, 2003). It is argued that inclusion of such values should assist in reflecting more adequate concern for conservation-based issues in relation to future generations (Gamborg & Rune, 2004).

Other studies point out the ways to measure forest values/orientations in natural resource settings. Bengston et al (1999), for example, constructed four broad categories of benefits and values of forests and forest ecosystems using their frequency of being mentioned in the U.S. media. These value orientations included recreation, commodity, ecological and moral/spiritual values. Manning, et al (1996) cited by Bengston et al (1999) similarly, created a typology of ten major values of parks based on a review of wilderness literature. They observed the following decreasing order of importance of park values: aesthetic, recreation, scientific/education,

moral/ethical, ecologic, therapeutic, economic, intellectual, historic/cultural, and spiritual. Pietarinen (1987) measured forest values through personal interviews by asking respondents to assess the importance of twenty-one different forest ownership objectives using a three-point scale (Not important, Important, Very important). He found out that the main objectives of owning forestry areas were monetary, recreational, emotional and aesthetic considerations (Pietarinen, 1987).

2.5 Factors influencing the values households attach to forest resources

Socio-economic factors, perceived benefits and benefit distribution**,** social capital, awareness about natural resource importance, knowledge and attitudes towards forest resources, cultural and institutional factors may influence the values users attach to forest ecosystems (Kiyingi & Bukenya, 2010).

2.5.1 Socio-economic factors

There are differences among demographic groups in terms of the values of forests to them (Poffenberger et al, 1992). Therefore, understanding users' socio-economic circumstances is fundamental to the management of forest resources (National Marine Sanctuaries, 2011). Variation in forest values and attitudes may be influenced by a variety of antecedent factors including socio-economic variables. According to McFarlane & Boxall (2000), women, people with higher levels of education, younger individuals, urban residents, people living in non-timber-dependent regions and those with a liberal political orientation hold stronger bio-centric values and support the principles of sustainable forest management.

The cultural significance, environmental awareness and direct or indirect benefits people derive from natural ecosystems may also influence the values communities attach to forest ecosystems (Robinson & Redford, 1991). A nationwide study in the United States revealed that ecological values were more important for women, younger respondents, whites and urban residents while economic values were more important for older, lower income, less educated, non-whites and rural respondents (Bright & Stinchfield, 2005). Occupation and income are closely tied together and are related to values and attitudes toward wildlife (Bright & Stinchfield, 2005). Family income and education can enhance personal efficacy and hence, reduce the dependency on forest resources. Education also enhances the powers of conduct within the social and physical world enabling development of general knowledge and consequently increasing responsibility towards the environment (Wickramasinghe et al, 1996).

An attitude refers to a tendency to evaluate a specific object, situation or issue with some degree of favor or disfavor (Moehrke, 2010). Attitudes are the most consistent explanatory factors in predicting users' valuation for environmental goods and services (Chyong et al, 2006). Environmental attitudes have been found to be significant explanatory factors in behavioural analyses of environmental participation decisions, consumer response, environmental management and recreation decisions (Luzar & Cosse, 1998). According to Chen & Chai (2010) attitudes of environmental concern are rooted in a person's inner-self. The degree to which an individual perceives himself or herself to be an integral part of the natural environment guides the appraisals of environmental objects (Luzar & Cosse, 1998). Thus, attitude represents what users of the environment like and dislike and the values they attach to forest resources (Chen & Chai, 2010).

People have attitudes about most things and the forest as an entity is not an exception. These attitudes are associated with socio-demographic factors such as age, sex, education, occupation, income, and place of residence, as well as participation in different types of forest-related activities (Hao, 2011). The values users attach to forest resources critically depend on their level of knowledge, attitudes and practices (Mansaray & Abijoye, 1998). Poteete & Welch (2004) argue that perceptions of resource importance and scarcity influence users to attach high values to forest resources and are necessary for CBFM. Thus, knowledge of users' attitudes and perceptions and valuation of forest resources by the various stakeholders provides vital information for planning ecotourism and forest conservation in general (Kiyingi & Bukenya, 2010). It informs policy on the factors that influence the success or failure of community-based natural resource management schemes.

One overarching dilemma, potentially leading to different forest value orientations, may be the current high level of environmental awareness in most developed countries, which may lead to public demands for conservation of the forest resources or eco-friendly forest management. It may also lead, however, to a high demand on the forest resource for recreation and eco-tourism (Nordlund & Westin, 2011). Knowledge is crucial for responsible environmental behaviour (Salam et al, 2006). In addition, by subscribing to organizational philosophies and working in certain environments, individuals are subjected to social norms that may impact on their forest values and attitudes. For example, members of environmental organizations are more bio-centric oriented than non-members (McFarlane & Boxall, 2000).

2.5.2 Perceived economic benefits and benefit distribution

The different interests or perceived economic benefits of forest resources by various stakeholders may result in differences in values people attach to forest ecosystems (Kiyingi & Bukenya, 2010). The economic value users attach to forest resources also depends on whether the financial and other benefits created through CBFM are sufficient to make a meaningful impact on local livelihoods and poverty reduction (Mahanty & Guernier, 2008). Calculations of costs and benefits depend on each actor's perception of the value of the resource, dependency upon it, its scarcity and alternative options for investment (Zaccagnini et al, 2001). The benefits that actually reach communities through CBFM (benefit flow) and how the benefits and costs are distributed at the community level (benefit sharing) are crucial determinants of what values stakeholders attach to forest recources (Mahanty & Guernier, 2008).

The two most important factors influencing benefit flow are property rights and, other policies and laws governing commercial use of resources such as permits, taxes and royalties. Local sharing of benefits is greatly influenced by local institutions and governance processes, decision making processes, participation and community conditions as they determine who gains what from CBFM (Mahanty & Guernier, 2008). There are also differences in values users attach to natural resources due to variation in market access (Godoy et al, 1993). Distance to markets influences the value obtained by local people from forest products. The further a family lives from markets, generally, the less value they receive from the collection of forest goods (Wickramasinghe et al, 1996).

2.5.3 Institutional factors

When renewable natural resources are held collectively, their management becomes an exercise in collective institutional development (Agarwal, 2001). Institutional factors, both formal and informal, have an impact on the management of natural resources and the value users derive and attach to those resources (Twine, 2005). This is mainly because institutional factors as well as other political, governance and capacity factors affect the benefit flow in CBFM (Mahanty & Guernier, 2008). This is because institutional arrangements restrain one group and release others and regulate the flow of economic goods and services. It is through these formal and informal constraints that knowledge is then revealed and employed to assist coordination of forest values (Lal, 1999).

The task of assigning a value to environmental damages is fundamentally institutional in nature. This is because the outcome of community forest resource management and the benefits that users derive from forests heavily depends on the institutional background. As a result, the values individuals attach to natural resources differ depending on the institutional arrangements (Dhakal & Bhatta, 2009). Comparative studies of privatization indicate that the property rights regime has economic consequences for values expressed in the market (Lal, 1999). Most components of environmental quality are public goods. Where property rights are not clearly defined, not cheaply defended and not transferable at low costs, the markets do not provide Pareto-efficient values (Shin et al, 1997). Clear property rights are important pre-conditions for effective management of the commons as they affect the value that users attach on those natural resources, people's incentives, actions and ultimately economic and resource outcomes. Some institutional arrangements and certain policies (for example, subsidies) may lead to undervaluation of natural

resources, providing resource users with misleading signals regarding the abundance of scarce natural resources and the environmental damage resulting from their use (Zaccagnini et al, 2001).

2.6 Factors influencing household decision to participate in community forest management

Generally, local peoples' decision to participate in CBFM is a function of the perceived economic benefits, formal and informal institutional background, the socio-economic and demographic (gender, age, level of education and income, etc.) attributes of the members, social networks and other external factors (e.g., technical assistance) (Coulibaly-Lingani et al, 2011).

2.6.1 Perceived economic benefits

Individuals' decision to participate in any program depends upon how they perceive the economic benefits from the program (Chhetri, 2005). Even when its characteristics favor cooperation, a group is unlikely to invest in collective action unless its members believe that the benefits outweigh the costs. If users do not obtain a major part of their income from a communally managed resource, the opportunity cost of organising and participating in collective action might be very high. Moreover, if the costs users incur in managing natural resources are higher than the income they get, it may not be worth to participate in CBFM (Shah & Maitra, 2004). Studies show that people who use forest resources but do not depend much upon those resources, will not attempt to protect forest resources even if other conditions suggest that they are able to do so. Likewise, households that do not perceive forest resources to be scarce or valuable or value other investment options more highly, have no incentive to participate in CBFM (Agrawal & Angelsen, 2010).

The level of the society's' dependence on forest either for food or as a source of income, their perception of the forest and the systems of appropriation used to extract forest resources are the main factors that affect the participation of the local users of forest resources (Obua, 2002). In communities that receive little financial benefit from forests, households may have a disincentive to participate in CBFM activities and to undertake sustainable resource management (Poteete & Welch, 2004). Resources with a high revenue potential are more likely to attract the interest of community members plus other actors, such as the state or the private sector (Maskey et al, 2006). Communities also attach little value to forest resources and hence, are less willing to participate in CBFM if they view initiatives focused on community involvement in forest conservation and management as a continuation of the state's control on forest resources (Zaccagnini et al, 2001). In some countries like Ethiopia, local communities have been unwilling to participate in forest activities with no clear basis on benefit sharing (Obua, 2002). Effective involvement of local people in Ethiopia has mainly been discouraged through state monopolies on market for wood and forest products whose controlled prices are below the economic value, thus leaving the local people without an incentive to engage in forest activities (Obua, 2002).

2.6.2 Institutional factors

Today, the management of local natural resources by communities is widely accepted as an institutional imperative (Agarwal, 2001). In order to motivate users to participate in the community forest management, users should have the right to extract products from the forest and exclude specific individuals who do not hold the rights. Property rights also give people incentives to adopt technology that increases long-term benefits. This, in turn, gives forest

resource users an incentive to improve the resource through participation in CBFM (Maskey et al, 2006).

Monitoring and sanctioning has been shown to be a key element in explaining successful common pool resource (CPR) management (Coleman, 2009). Institutions limit the effects of population pressure and variable proximity to forest resources. Institutions also direct the evolution of forms of heterogeneity that affect levels of trust, the predictability of interactions and interests in collective action (Poteete & Welch, 2004). Rule enforcement develops trust among individual users by assuring them that other users will comply with the agreed rules and that no individual will gain advantage over others. Thus, rule enforcement is a necessary condition for successful resource management. As a result, property rights and their security (confidence that rights and benefits to forests will not be denied) influence whether individuals or groups will invest time and effort in the sustainable management of forests (Mwangi et al, 2011).

Among the most important factors that affect the level of consumptive use of forests in many African countries is security of tenure and law enforcement. Security of tenure is even more important than the type of tenure because, where law enforcement is not adequate, there is open access and use of forest resources, much to the benefit of those that lack security of tenure (Obua, 2002). Findings on institutional arrangements in community forestry indicate that rules that are: easy to understand and enforce, locally designed and accepted, taking into account different types of violations, assisting management of conflict and holding users and officials accountable, are most likely to lead to effective individual participation in CBFM (Ostrom, 1990).

2.6.3 Forest resource-based conflicts

Conflicts over the appropriation, management and use of forest resources can pose significant constraints to participation in CBFM (Ostrom & Wertime, 2000). The major forest conflicts are those relating to utilization and management rights. However, there are also conflicts both within and between communities over control of forests (Obua, 2002). According to Kaboggoza (2000) cited by Obua (2002), conflicts often arise over resource use and control among governments, their agencies, the private sector and local communities. However, according to Kuentzel & Dennis (1998), much of the conflicts in environmental management are as a result of different people valuing specific forest functions differently. Forest resource-based conflicts can also be a product of poor or unclear natural resources policies and unresolved socio-economic problems. They can also arise over the type, quantity and frequency of product harvesting. Despite the causes of these conflicts, their main effect is lack of interest of users to participate in CBFM (Obua, 2002).

2.6.4 Socio-economic factors

Poor understanding of the socioeconomic factors that influence household decision to participate in CBFM may adversely affect the strategy adopted for organizing community participation and its sustainability. Social factors, such as poverty, livelihood profile, cultural beliefs, status of weaker social groups, rights of minority and ethnic groups, have an effect on household's decision to participate in CBFM programs (Agarwal, 2001). Other socio-economic factors affecting people's participation in natural resource management include easy availability of grants and subsidies, prejudices and discrimination against women, illiteracy and lack of awareness, factionalism and heterogeneity of population, disparities in wealth and social status,

interference by politicians and misunderstanding about the motivation and objectives of people's organization (Degeti, 2003).

2.6.4.1 Household composition

The socio-demographic characteristics of households are essentially measures of a household's productive capacity which influence households' choices and preferences over use of different resources (Agrawal & Angelsen, 2010). For example, studies carried out in South Africa and in other developing countries clearly indicate that there is a strong positive correlation between household size and the consumption pattern of the wood-based products of community forestry (Shackleton et al, 2004). Thus, the demand for fuel-wood and most other forest products, for example, vary directly with household size and might influence preferences to manage forest resources.

In Burkina Faso Coulibaly-Lingani et al, (2009) found that larger families largely depended on forest resources to diversify household livelihoods. Thus, the heads of such households had strong motivation to be involved in decisions (attending meetings, the agreement on decisions during meetings and the ability to influence decisions in meetings) related to forest management. According to Maskey et al, (2006) some heads of large households are also usually rich and powerful and thus may play a significant role in the decision-making process. The number of adults of working age can also affect households' capacity to allocate labor between CBFM and other activities such as crop production and may again influence the decision to participate in CBFM (Ur-Rehman & Chisholm, 2007). The main influence of the socio-demographic factors can be on the level of participation in management and community-based activities (Agrawal & Angelsen, 2010).

2.6.4.2 Ethnic homogeneity

Although, the impacts of group size and heterogeneity on forest commons outcomes are uncertain (Agarwal 2001), most resources are managed by groups divided along multiple dimensions, such as ethnicity, gender, religion, wealth and caste (Agrawal & Angelsen, 2010). A large number of empirical studies suggest that similar group heterogeneities may produce different effects under different circumstances. However, characteristics such as gender, indigenous status, ethnicity, class and income are particularly relevant to explain forest management outcomes.

Different dimensions of social, political or economic heterogeneity can have different effects on resource governance (Maskey et al, 2006). There is a distinct relationship between ethnic homogeneity and social capital, mainly in trust and participation. Ethnically diverse communities are poor in social networks and low in participation. Individuals living in more racially fragmented societies participate less. Therefore, policy makers in CBFM should pay attention to the dynamics of ethnic construct of the community, especially with respect to immigrants to the community (Maskey et al, 2006). Political and cultural differences within the community can also create problems among stakeholders, resulting in lack of interest to participate in CBFM **(**Agrawal & Angelsen, 2010).

2.6.4.3 Poverty and income inequality

Like ethnicity, there is fairly strong evidence that the level of civic participation is stronger in societies with higher and similar income groups (Maskey et al, 2006). People living in more unequal communities are less likely to join groups. It appears that the economic homogeneity of

a community transmits development of trust and participation and makes organizing community activities easier (Agarwal, 2001). Thus, addressing vulnerability and poverty reduction as part of forest management strategy is necessary for the success of CBFM. This also means that organizing community participation requires twinning with the objectives of CBFM with poverty reduction (Maskey et al, 2006).

Concerning the effect of family income on participation in environmental development programs, several studies have shown that households with higher income levels are more likely to engage in environmental development programs (Salam et al, 2006). This is mainly because the demand for environmental services rises as income increases (Antle & Heidebrink, 1995). Increases in income may increase the demand for environmental quality, not only because households have greater control over resources but also because higher incomes encourage more effective public sectors to solve environmental degradation problems. Further, higher incomes are accompanied by higher education, increasing the awareness of environmental degradation and its harmful effects (McConnell, 1997).

2.6.4.4 Gender

The gender disparity in decision-making power within households harms the participation of women, thereby losing women's potential both in human resource and knowledge in CBFM (Maskey et al, 2006). Women are often excluded from participation for reasons including: responsibilities and expected behaviour, the rules governing the community forestry groups, social barriers stemming from cultural constructions of gender roles, logistical barriers relating to the timings and length of organizational meetings and male bias in the attitudes of those promoting community forestry initiatives (Mwangi et al, 2011).

Empirical studies on women's participation often cite the social context as one of the important factors affecting women's participation (Kalpana, 2009). Women continue to be disadvantaged by insecure access and property rights to forest and tree resources, discrimination and male bias in the provision of services, including credit and technology, and exclusion from decision making at household, community and national levels. Moreover, because of lack of personal networks, formal education and employment, they are poorly placed to influence resource allocation or research priorities (Mwangi et al, 2011). The fact that women bear the main responsibility for childcare and housework, in addition to their share of agricultural work, cattle care, etc., means that they have high work burdens and logistical constraints. This seriously restricts women's ability to attend lengthy meetings held at inconvenient times (Agarwal, 2001).

2.6.4.5 Users' attitudes and perceptions about forest resources

Gibson (2001) argues that perceptions of resource salience and scarcity are necessary for collective management of forest resources. In his study, two villages in Guatemala had several characteristics that are associated with successful collective action, including relatively small sized group, relatively homogeneous interests in the forest and prior experience with collective action. However, there was a poor level of participation in CBFM because community members did not consider forest products to be scarce to warrant conservation measures. In contrast, recognition of the link between the depletion of trees and the scarcity of water led one of these villages to create rules to protect a portion of their forest that was in the relevant watershed (Gibson, 2001).

Local perceptions about dependency on direct and indirect forest services strongly affect decisions about protecting forest resources. This is because perceptions about dependency influence households to attach high values on forest resources causing households to participate in CBFM programs. High present values for immediate consumption of particular goods and high costs of institutional creation contribute to failures to develop rules to protect the resource base (Poteete & Welch, 2004).

2.6.4.6 Social capital

The concept of social capital is very controversial in development economics. As a result, this study does not investigate how social capital influence household decision to participate in CBFM programs. However, this study agrees with Coulibaly-Lingani et al (2011) who recognized social capital as an important resource for shaping individual's participation in CBFM. This is because while the technical aspects of CBFM are important, it is the cooperation between and active participation by local beneficiaries through their community institutions that determines successful outcomes (Dahal & Adhikari, 2008).

According to Putnam (1993), social capital refers to features of social organizations, such as networks, norms and trust that enable participants to act together more effectively to pursue shared objectives. Since collective capability and action is required to manage existing and new structures created by the project, the success of CBFM programs depends upon consensus among the users. This is dependent upon the existence of trust, norms and networks, which over a period of time tend to be self-reinforcing and cumulative. It can also depend upon the intervention of external agencies such as Non-Governmental Organisations (D'Silva & Pai, 2003). Characteristics of groups including size and homogeneity do influence the ability of some

resource users to gain trust that others will not break the rules and substantially over-harvest. Without substantial trust in the reliability of members of a resource user community, it is hard to establish cooperation in the management of a shared natural resource (Poteete et al, 2010). Thus, social capital is a vital input which influences other members' decision to join and participate in CBFM.

2.7 Summary

This chapter has reviewed literature on household valuation of forest resources and participation in CBFM programs. It has been established that households can have an anthropocentric/bio-centric, instrumental/non-instrumental or commodity/non-commodity orientations towards forests. They can also attach economic, recreational, livelihood, aesthetic and cultural/spiritual values to forests. Such forest value orientations are influenced by a number of socio-economic and institutional factors of the household and community. The socio-economic and institutional factors in addition to the values households attach to forest resources also influence their decision to participate in CBFM programs.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology followed to achieve the objectives of the study. Firstly, it discusses the methods used to collect data (study area, instrument and sampling methods) followed by the conceptual approach. Secondly, the chapter discusses the Principal component analysis (PCA) technique used to determine the values households attach to forest resources. It also discusses how data were analysed by presenting the empirical models used to predict the values households attach to forest resources and their position on participation in CBFM. Lastly, a discussion of the regression model diagnostics and a brief summary of the explanatory variables used in the study are provided.

3.2 Methods of data collection

3.2.1 Study area

The study was conducted in Escourt, Bergville and Msinga areas of KwaZulu-Natal. The specific communities managing forests in each of these areas were KwaSobabili, New Reserve B and Gudwini communities, respectively. The communities comprised of black people. The CBFM initiatives in the three areas had been identified through SCI-SLM, a project which fosters to add value to community initiatives aimed at solving problems of land degradation in South Africa. The three CBFM initiatives had also been organised and nurtured by the respective communities over years, with no external influence. The regulations in place were designed and monitored internally with penalties/sanctions in place. One common factor among the three forest areas was

that they were all being managed by committees, although there were differences in other institutional arrangements.

In Bergville, the New Reserve B community was managing a Black Wattle Forest which covered about 45 hectares. The CBFM initiative started in 1992 and the New Reserve B Community Development Committee was managing the forest. Pre-1990, the forest was administered by the 'then' Zulu Government (ZG) who introduced the 'ticket system' for households to access wood for homestead use. When the ZG was abolished, the community members established their own structures to manage development processes in the area, including running the forest. In the early 1990s, realising the poor maintenance and the need to retain the economic value of the forest, the community set up a development committee to manage the forest. The community structure in New Reserve B worked closely with the headman, who is the traditional figure, to regulate the use of the forest. The primary focus of the CBFM was for the community to have access to logs for burial purposes and timber for making livestock pens, firewood and for building houses. There were 118 households that were entitled to obtain benefits from the wattle forest. Due to conflicts over resource use and control between New Reserve B and New Reserve A and C, the other two communities, A and C had opted out of the CBFM (SCI-SLM, 2010).

In Escourt, the CBFM started around 2000, when the KwaSobabili community revived the Black Wattle forest. Initially, the wattle forests in the area were established for use by the chieftaincy. The chieftaincy would access fire wood, building materials and any other uses deemed necessary. When a new chief took over in 1995, she initiated the KwaSobabili community forest which comprised mainly of black wattle trees. Through the traditional structures, she allowed her subjects to access the forest for 'burial logs' and construction poles for use by those who had lost

homes due to natural disasters. There were 526 households that were entitled to derive benefits from the forest (SCI-SLM, 2010).

In Msinga, the initiative to manage the natural forests was started in 1945 when the Inkosi (Chief) took over to lead the Machunwini Tribal Authority in which Gudwini sub-ward falls under. Thus, the chief, who was passionate about nature and the indigenous forests in his areas, was the main source of the social innovation (SCI-SLM, 2010). After realising that the forests were being used unsustainably leading to their detrimental loss, he encouraged the villagers under his authority to preserve forests and use them wisely. This initiated the process of managing the forests by the Gudwini community. The headman, who was a traditional figure responsible for the Gudwini area, was spearheading the CBFM program (SCI-SLM, 2010).

3.2.2 Sampling

The study was based on primary cross-sectional data collected using a stratified random sample drawn from the three communities described. Households from each community were further stratified into participating and non-participating households. Two separate lists (i.e., for participating and non-participating households) were compiled. The distribution of participating and non-participating households in each community was as shown in Table 3.1.

Table 3.1: Distribution of participating and non-participating households in the three communities studied

Area	Participating households	Non-participating households	Total number of households
KwaSobabili	22	502	526
New Reserve B	15	103	118
Gudwini	16	59	77

Source: Survey data (2011)

To obtain equal representation across the three communities, equal numbers of households (51) were targeted from each community instead of proportional sampling. This is because more households would have been selected from KwaSobabili (with a total of 526 households) and very few from Gudwini (which had only 77 households) if proportional sampling had been used (Table 3.1). A preliminary survey in the three communities had established that households were either participating, willing to join and participate or unwilling to participate. Thus, the study also aimed to get an even distribution of households across the three categories. Since the proportion of participating households was very small, all participating households were targeted in the sample. On average, the number of participating households was almost the same across the three communities despite the large differences in the total population that was entitled to derive benefits from the forests. The average number of participating households in the three studied communities was seventeen. The average number of participating households was multiplied by three (i.e., number of categories) to give the number of households sampled in each community (i.e., total of 51 households from each community). Since 51 households were required from each community, the remaining households were randomly selected from the non-participating list of households. This procedure also allowed an even distribution of households across the three participation categories (Table 3.2). However, thirteen (24%) of the participating household heads were not included in the sample because they were not available during the time of the interviews.

Participating households were defined as those households that were driving forward the CBFM programs. Such households had one or more household member(s) who were involved in either decision making, needs assessment, resource mobilization and implementation activities. Participating households were those who were voluntarily involved in doing different activities

without payment or direct compensation. During the survey, sampled households were identified from the two lists of participating and non-participating households with the help of two committee members, from each community, who knew the households well.

Table 3.2: Distribution of participating and non-participating households sampled

Community	**Participating households**	**Non-participating**		**Total**
		Willing to join and participate	Unwilling to join and participate	
KwaSobabili	17	19	15	51
New Reserve B	11	15	25	51
Gudwini	12	19	20	51

Source: Survey data (2011)

3.2.3 Data collection instrument

Data used in this study were obtained from a questionnaire survey of 156 household heads from KwaSobabili, New Reserve B and Gudwini rural communities. The questionnaire comprised mainly of structured questions in order to obtain qualified answers (*Appendix 1*). However, a few other questions were left open-ended to give interviewees a chance to express their views and draw lessons from their wisdom. The questionnaire was translated into the local language (isiZulu) with the help of a translator. It was then pre-tested, on six randomly selected households in Gudwini. Following the pre-test, some questions were deleted and others modified to improve their clarity and ensure their contextual relevance.

The questionnaire was subdivided into ten sections. The first section of the questionnaire gathered information on the socio-economic aspects of the household as well as the household head's environmental awareness and attitudes towards forest resources. The second section collected information on the values households in KwaSobabili, New Reserve B and Gudwini

rural communities attach to forest resources. In this section, the household head was asked to rate the importance of each of the 21 forest functions on a five-point Likert Scale where; 1= opposed to my values; 2 = unimportant; 3 = neutral; 4 = important; 5 = very important.

The third section aimed to get information on the institutional arrangements in place in the CBFM. The fourth section collected information on the households' willingness to participate in CBFM. This section, grouped the household head into four categories, based on their position on participation in CBFM *i.e.*, those who were participating; those who were not participating but would want to join, those who have stopped participating, and those who were not participating and not interested to join.

3.3 Conceptual approach

To identify the values that households in KwaSobabili, New Reserve B and Gudwini rural communities attach to forest resources (value orientations), 21 forest functions were compiled following studies by Bengston et al (1999), Cocks et al (2012), Cocks et al (2003), Dovie et al (2002), Dovie (2003), Geldenhuys (1999), Ngcobo (2002), Shackleton & Shackleton (2006), Shackleton & Shackleton (2003), Shackleton (2009), Shackleton et al (2007), Twine et al (2003) & SCI-SLM (2010). The household head was asked to rate the importance of each of the 21 forest products and services on a five-point Likert Scale (*see appendix 1, section B*). To obtain quantitative measures of the values households attach to forests resources (forest value orientations) as well as to extract the dominant forest products and services that influenced such valuation, Principal Component Analysis (PCA) was used. Principal component analysis (PCA) is a statistical technique used to transform a large number of correlated variables to a smaller set of uncorrelated, composite variables called principal components (PCs) (Ma et al, 2011). The

PCs were defined and named using the relative component loadings. Following a study by Nieuwoudt (1977), absolute PC loadings greater than 0.50 were considered dominating and indicated a strong association among the forest products and services used to generate that particular PC.

According to Kim & Mueller (1994), distortions in data scaling caused by ordinal data distort the correlations between variables and hence distort the PC results. They, however, indicated that the correlation coefficients are fairly robust with respect to ordinal distortions in measurement and further advised that researchers can apply PCA to data containing ordinal variables and limit such distortions by specifying a greater number of ordinal data categories in their underlying theoretical framework/survey questions so that the range of the coded values increases (Kim & Mueller, 1994). Likert type scales with at least five categories (coded 1-5) are recommended (Garson, 2009).

To establish how the different socio-economic and institutional factors influence the values households attach to forest resources, Generalised Least Squares (GLS) regression was used. The composite indices generated from PCA (proxies for the values households attach to forest resources) were used as dependent variables while the socio-economic and institutional factors were the explanatory variables. A detailed description of the variables is given in Table 3.3. Instead of running separate regressions for each community, a single equation was run across the three communities with dummies to represent the different communities. Pooling the regression (i.e., including all the observations in one regression) across the three communities was done to increase the degrees of freedom, and improve the relative efficiency of the estimated parameters (Gujarati and Porter, 2009).

To determine whether the values households attach to forest resources (composite indexes from PCA) socio-economic and institutional factors influence the households' position on participation in CBFM in KwaSobabili, New Reserve B and Godwini rural communities, the Multinomial Logit Model (MNL) model was used. The MNL was used to estimate the participation status of households in CBFM since the response variable had multiple or more than two categories. According to Little (1994) participation is defined as an active process by which beneficiary groups influence the direction and execution of a development or natural resource management project with a view of enhancing their well-being in terms of income, personal growth, self-reliance or other values. In this study, a household was considered as participating if one or more of its members were involved in any of the following forest management activities; decision making, needs assessment, implementation, resource mobilisation, and monitoring and evaluation etc. Participation in decision making and needs assessment were assessed by household member's attendance of CBFM meetings. Resource mobilisation was assessed by whether a household contributed or sourced funds or tools for the CBFM program. Households that were involved in coppicing and cutting down of the trees and guarding forests were considered to be participating in CBFM implementation. Households that were involved only in resource harvesting were not considered as participating. The level of participation was not considered in this study.

In a similar study, the MNL model was used to estimate and predict the outcome in every forest given a set of institutional and socio-economic factors of each household (Chhatre & Agrawal, 2008). In this study, the decision to participate was indicated by the household's position/status on participation in CBFM. Households were either; 1 = Already participating; 2 = not yet

participating but interested to join; 3 = stopped participating and 4 = not interested to join the CBFM). Since the parameter estimates in MNL are estimated by the method of maximum likelihood, the MNL assumes that large samples of data are used (Garson, 2009). There were only three household heads that had stopped participating in CBFM. To avoid the problem of micronumerosity (small sample size) the category 'stopped participating' was merged with the category 'not willing to join and participate' since households in both categories did not have the intention to participate in CBFM.

Thus, in this study, the position of the household on participation (participation status) in CBFM, a categorical variable; 1 = Already participating; 2 = not yet participating but willing to join; 3 = not willing to join the CBFM), was the dependent variable. Household head's characteristics (*i.e.*, age, gender, marital and employment status, level of formal education, level of environmental awareness) and household characteristics (*i.e.*, size, income, dependence on forest resources, proximity to forests and amount of firewood collected by the household every week) were some of the socio-economic independent variables. Clarity of CBFM rules, source of CBFM control and presence of CBFM conflicts were some of the institutional variables used in the MNL model. Data were analyzed using IBM (SPSS) statistical package (version 19) and STATA version 11.

3.4 Empirical methods of data analysis

Descriptive analysis was used to summarize the household demographics and the characteristics of the studied communities. It was also used to describe the household demographics for participating and non-participating households. PCA was employed to develop a composite index to represent the values households attach to forest resources. It was used to condense 21

forest values (scores of relative importance) into a smaller set of dimensions/factors (value orientations) with a minimum loss of information (Kim & Mueller, 1994). Each factor was also interpreted according to its loadings to reveal "latent" patterns of relationships among the variables. Empirical models were also developed to estimate the parameters of the explanatory variables influencing the values households attach to forest resources and their participation status.

3.4.1 Model for estimating household forest value orientations

To establish how the different socio-economic and institutional factors influence the values households hold towards forest resources, Generalised Least Squares (GLS) regression was used. The composite indices generated from PCA (proxies for the values households hold towards forest resources) were used as dependent variables while the socio-economic and institutional factors were the explanatory variables. Application of OLS before GLS was done to allow testing for multicollinearity, heteroskedasticity and autocorrelation. Thus, Generalised least squares regression was further employed in all the models for estimating the values households hold towards forest resources since heterokedaticity had been detected in the OLS models. The model was specified in the general form as:

The model was specified in the general form as:

$$W = f(X_k,....X_n, u_1) \quad (1)$$

Where;

W = household's forest value orientation (*i.e.*, the value household attach to forest resources (composite index from PCA),

X_k = explanatory variables,

k = 1, 2, 3...n, (where n is the number of parameters considered) and,

u_1 = error term (assumed to be normally distributed with mean zero).

3.4.2 Model for estimating household participation status

To identify the factors that affect a household head's decision to participate in the conservation of forest resources, the MNL model was used. This regression technique is used to estimate the parameters of an equation in which the researcher wants to explain and predict a polychotomous (*i.e.*, more than two categories) qualitative response dependent variable (Gujarati & Porter, 2009) as a function of explanatory variables (X_k) that describe the characteristics of an individual. The dependent variable was the participation status (1 = already participating; 2 = not participating but willing to join; 3 = not participating and not willing to join).

Letting P_j (j = 1,2,...3) to be the probabilities of a household being in each participation category and assuming that (j = 1) is the reference category, the MNL showing the relative probabilities of being in the three participation categories as a linear function of X_k for the i^{th} household, according to Greene (2003), is estimated as:

$$\text{In } (P_j/P_1) = \log_e (P_j/P_1) = \beta_{0j} + \beta_{1j}X_{1i} + \ldots \beta_{kj}X_{ki} + u_{ji} \quad (2)$$

For j = 2,3 and i = 1,2...n households where:

- In = the natural logarithm (or $\log_e$)
- P_1 = the probability of the household being in the reference category (the household is already participating);
- P_2 = the probability that the household is not participating but willing to join the CBFM.
- P_3 = the probability that the household is not participating and is not willing at all to join and participate in CBFM.

- β_{kj} are the MNL coefficients to be estimated, and,
- X_{ki} is the k^{th} explanatory variables describing the i^{th} household

Following Carter-Hill et al (2008), the conditional probability of the i^{th} household being in the three alternative categories (j = 1, 2 or 3) are estimated by equations 3 to 5 as a function of the estimated β_{kj} and the X_{ki} as:

$$P_i(j=1) = \frac{1}{1+\exp(\beta_{02}+\beta_{12}X_{1i}+\ldots+\beta_{k2}X_{ki})+\exp(\beta_{03}+\beta_{13}X_{1i}+\ldots+\beta_{k3}X_{ki})} \quad (3)$$

$$P_i(j=2) = \frac{\exp(\beta_{02}+\beta_{12}X_{1i}+\ldots+\beta_{k2}X_{ki})}{1+\exp(\beta_{02}+\beta_{12}X_{1i}+\ldots+\beta_{k2}X_{ki})+\exp(\beta_{03}+\beta_{13}X_{1i}+\ldots+\beta_{k3}X_{ki})} \quad (4)$$

$$P_i(j=3) = \frac{\exp(\beta_{03}+\beta_{13}X_{1i}+\ldots+\beta_{k3}X_{ki})}{1+\exp(\beta_{02}+\beta_{12}X_{1i}+\ldots+\beta_{k2}X_{ki})+\exp(\beta_{03}+\beta_{13}X_{1i}+\ldots+\beta_{k3}X_{ki})} \quad (5)$$

In this study, the category 'already participating' in CBFM was used as the reference category. According to Madalla (1983), the reference category is usually the one that makes most sense (*i.e.*, is of most interest to the researcher). In this study the 'already participating' category was the category of most interest to the researcher because household participation is core in CBFM. Choosing this as the reference category allowed the researcher to compare those households that were not participating (*i.e.*, in categories 'willing to join and participate' and 'not willing to join and participate') to those that were already participating.

3.4.3 Regression model diagnostics

Testing for the overall significance of the two regression models was done using F-tests and utilizing R-squared measures of fit. In addition, the OLS models were also tested for heteroscedasticity, multicollinearity and autocorrelation. In this study, multicollinearity was

checked by examining variance inflation factors (VIF) from a correlation matrix using SPSS. Heteroscedasticity in the OLS regression models was tested using the Breusch-Pagan Test (Gujarati & Porter, 2009). To get best, linear, unbiased and efficient (BLUE) estimates the Generalised Least Squares (GLS) instead of OLS, therefore, had to be applied in all the models since heteroscedasticity had been detected. Autocorrelation was tested using the Durbin-Watson method (Gujarati & Porter, 2009).

3.4.4 Description of dependent and explanatory variables used

Table 3.3 provides a description of the dependent and explanatory variables used in the GLS models to estimate the values households in the study communities attach to forests. A description of the variables used to estimate households' participation status is also provided in Table 3.4. Variables used in the chi-squared test explaining short-run differences between already participating households and those interested to participate are provided in Table 3.5.

Table 3.2: Variables to estimate the value households attach to forest resources

VARIABLES	DESCRIPTION
Dependent	
ANTHRPCNTRIC_VAL	An index representing the anthropocentric value household attach to forests. (First composite factor from PCA)
CULTURAL_VAL	An index representing the cultural/moral/spiritual value household attach to forests. (Second composite factor from PCA)
NON_USE_VAL	An index representing the non-use/option value household attach to forests. (Third composite factor from PCA)
Explanatory	
AGE	Household head's age (years)
GENDER	Dummy; 1 if individual is male and 0 female
HHOLD_SIZE	The number of members that are in each household
MARITAL_STAT	Dummy; 1 if individual is married and 0 otherwise
EMPLOYNT_STAT	Dummy; 1 if household head is employed and 0 otherwise
LEVEL_OF_EDUC	The number of years the household head has been in formal education
LEADRSHP_PSTN	Dummy; 1 if household head had a government, traditional, political or any other leadership post in the community and 0 otherwise
FARM_ACTIVITY	Dummy; 1 if household engaged in some crop production activities and 1 otherwise
EMPLYD_MEMB	The number of members in each household that were employed.
DIST_TO_FOREST	The distance from household to the forest, measured as time taken to get to the forest (in minutes)
SEL_FRST_PRDS	Dummy; 1 if household sells any forestry products and 0 if otherwise
ACCESS_TO_ELEC	Dummy: 1 if household has electricity and 0 otherwise
INCOM_AB_MEAN	Dummy; 1 if household gets above average annual income and 0 otherwise
TOT_SOC_GRANT	
ALTRNTIVE_SRCS	*See table 3.4*
ENVIRONT_AWA	Level of environmental awareness of household head: Ordered variable - measured by the environmental awareness test with a maximum score of 6
HH_PART-STAT	Dummy: 1 if household was participating in CBFM and 0 otherwise
NO_OF_HDLOAD	*See table 3.4*
HARV_PROHIB	Dummy: 1 if household head was dissatisfied with harvesting prohibition and 0 otherwise
CULTR_BENEFIT	Dummy: 1 if household's head recognizes some cultural uses of forests and 0 otherwise
D1	Area dummy: 1 if household is from KwaSobabili and 0 otherwise
D2	Area dummy: 1 if a household was from New Reserve B and 0 otherwise
D3 (intercept)	Area dummy: 1 if households were from Gudwini and 0 otherwise

Table 3.3: Variables used to estimate households' participation status

VARIABLES	DESCRIPTION
Dependent	
HH_PARTICIPATION_STAT	Household participation status; categorical variable (*i.e.*, 1 = already participating; 2 = not participating but willing to join; 3 = not participating and not willing to join).
Explanatory	
AGE	*See table 3.3*
GENDER	*See table 3.3*
MARITAL_STAT	*See table 3.3*
LEVEL_OF_EDUC	*See table 3.3*
HHOLD_SIZE	*See table 3.3*
ABOVE_15	The number of household members above 15 years old
EMPLOYNT_STAT	*See table 3.3*
LEADRSHP_PSTN	*See table 3.3*
EMPLYD_MEMB	The number of members in each household that were employed.
INCOM_AB_MEAN	*See table 3.3*
TOT_SOC_GRANT	The total amount of money received from child grants, disability grants and pensions in a year (Rands)
ACCESS_TO_ELEC	*See table 3.3*
DIST_TO_FOREST	*See table 3.3*
FARM_ACTIVITY	*See table 3.3*
SEL_FRST_PRDS	*See table 3.3*
ALTRNTIVE_SRCS	A proxy for household dependence on forest products. Dummy: 1 if household had alternative forests where they get the most important forest products and 0 otherwise.
NO_OF_HDLOAD	The number of head loads of firewood a household collects from the forest each week.
ENVIRONT_AWA	*See table 3.3*
PERCEPTN_OF_DEGRAD	Dummy: 1 if household head perceives there is forest degradation in the area and 0 otherwise
PRESRVTN_OR_UTILSTN	Dummy: 1 if household head prefers preservation and 0 if he/she prefers forest utilization.
CLARITY_OF_RULES	Dummy: 1 if household head perceives CBFM rules to be clear 0 otherwise
SRCE_OF_CBFM_CONTR	Dummy: 1 if household head perceives that the forest is under the control of the community and 0 if external control
D1	*See table 3.3*
D2	*See table 3.3*
D3 (intercept)	*See table 3.3*
ANTHROPCNTRIC_VAL	*See table 3.3*
CULTURAL_VAL	*See table 3.3*
NON_USE_VAL	*See table 3.3*

Table 3.4: Variables used in the chi-squared test explaining short-run differences between already participating households and those interested to participate

VARIABLES	DESCRIPTION
Dependent	
PARTICIPATION_STAT	Participation status; categorical variable (*i.e.*, 1 = already participating; 2 = not participating but willing to join)
Explanatory	
SATISIFAXN_WIT_COMITEE	Dummy: 1 if the household head is satisfied with the CBFM committee and 0 otherwise
DISCRIMINATION	Dummy: 1 if household head perceives some people are discriminated in CBFM and 0 otherwise
CONSVTN_RESPONSBLTY	Dummy: 1 if household head believes it is the responsibility of the community and 0 if they believe it is the responsibility of the government or other external organisations
TRUST_ON_BENEFITS	Dummy: 1 if household head trusts that the benefits from CBFM can be distributed without problems and 0 otherwise
HARVEST_PROHIB	*See table 3.3*
UNDRSTND_CBFM _PLAN	Dummy: 1 if household head believes he/she understands CBFM plan and 0 otherwise

3.5 Summary

This chapter has presented the research methodology adopted in the thesis focusing on methods of data collection and data analysis. On data collection, the chapter has provided background information on the study area, an explanation of how the sample of households in the three communities was obtained and an explanation of the data collection instrument that was used. On data analysis, the chapter has presented the conceptual framework as well as the empirical methods used to analyze data. Lastly, the chapter has provided a description of both the dependent and explanatory variables used in the study.

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the main findings of the study. It reports on the values households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal attach to forest products and services, and whether these values, and other socio-economic and institutional factors, influence their decisions to participate in CBFM. The results address the objectives of the study presented in section 1.4 of chapter 1. Descriptive statistics such as frequencies, means and percentages were used to describe the household and community characteristics. Principal Component Analysis was used to determine quantitatively, the different values households attach to forest resources. Generalised Least Squares (GLS) regression and the Multinomial Logit (MNL) model were also employed to determine the factors influencing the different values households attach to forest resources and their decision to participate in CBFM, respectively. The details of these models are presented in Chapter 3.

4.2 Demographic characteristics of the studied communities

The demographic details of the studied communities are given in Table 4.1. Two of the communities (KwaSobabili and New Reserve B) were managing wattle plantations while the community in Gudwini was managing a natural forest. Out of the 156 sample of households, 43 (27.6%) were male headed households and 113 (72.4%) were female-headed households. In this sample, there were more female-headed households than male-headed households because the de facto household heads (*i.e.*, those who stayed in the household for at least four days in a week) were considered as the household heads. Thus, although some males were 'lawfully' the

household heads, they worked elsewhere (e.g., in towns, mines, farms, cities), and were not with their households for more than four days in a week. The average family size for the sample was 6.6 and was almost the same across the three communities. Social grants were the major source of household income in the three communities. All the respondents were Zulu.

Table 4.1: Key characteristics of the studied communities managing forests

Characteristics of communities	**Community**			**Overall sample**
	KwaSobabili	**New Reserve B**	**Gudwini**	
Type of forest managed	Plantation	Plantation	Natural	
Main source of household income	Social grants (61.6%)	Social grants (76.9%)	Social grants (77.0%)	Social grants (72.3%)
Source of inspiration	Chief	Committee	Chief	
No. of households with electricity	50 (96.2%)	52 (100%)	0 (0.0%)	105 (67.3%)
Male-headed households	17 (32.7%)	16 (30.8%)	10 (19.2%)	43 (27.6%)
Female-headed households	35 (67.3%)	36 (69.2%)	42 (80.8%)	113 (72.4%)
Important crops grown	Maize (59.6%)	Vegetables (64.2%)	Vegetables (57.7%)	Maize 62 (39.2%)
Main product from community managed forests	Burial logs (69.2%)	Burial logs (63.5%)	Firewood (58.8%)	Firewood (39.9%)
Average household size	6.6	6.3	6.8	6.6
Households selling forest products	0.0	0.0	11 (21.2%)	11 (7.1%)

Source: Survey data (2011)

In Gudwini, the natural forest provided the communities with a number of livelihood services. The main products from the natural forests were firewood and construction timber. The Gudwini community heavily relied on the forests for firewood since they had no access to electricity. They also depended heavily on these natural forests for timber for constructing livestock pens

but were less dependent on these forests for timber to construct their houses since the timber was considered to be of poor quality. Households in the Gudwini community also obtained other non-timber products such as traditional medicine, fruits and mushrooms. Although Mogaka (2001) reported that the use of forest-based traditional medicines is worth between US$77-155 million in South Africa, no household from this sample indicated that they were selling traditional medicine.

In KwaSobabili and New Reserve B, the community-managed forests were mainly used for the provision of burial logs and construction timber for poor households, including child-headed families that could not procure timber to build their own houses. They also served as sources of timber for households affected by natural disasters (e.g., storms) and for any community projects deemed necessary. Although these communities were not getting any revenue from these forests, efforts were underway to revive these plantations into income generating projects. In these communities, there was no dependence on the community-managed forest for income since no household was selling any product from the wattle plantations. Likewise, in Gudwini, only a few households (7.1%) were selling craftwork products and dancing sticks (for the Zulu dance) from the natural forest. The proportion of household income obtained from such activities was very little. In general, all the three community-managed forests were important for social and other livelihood benefits which are not financial. Apart from these community-managed forests, most households (81.9%) were using other alternative forest as sources of forest products.

4.3 Values households attach to forest resources

In this study, PCA was used to generate composite indices or factors representing the values household attach to forest products and services (value orientations). This was done by

employing PCA on the scores of relative importance of 21 forest products and services identified based on previous studies (i.e., Dovie et al., 2002; Dovie, 2003; Dube, 2010; Geldenhuys, 1999; Mogaka, 2001; Ngcobo, 2002; Shackleton & Shackleton, 2003; Shackleton & Shackleton, 2006; Shackleton et al., 2007; Shackleton, 2009; and Twine et al., 2003) (*see appendix 1, section B*). In this study, the unrotated component matrix was reported. The rotated component matrix was not used because it was more difficult to attach economic meaning to the PCs (*see appendix 2*). Six principal components were extracted from the covariance matrix since all the scales were measured in the same units. The first six components explained 25.2%, 12.1%, 10.2%, 7.7%, 6.4% and 5.8% of the variation, respectively (Table 4.2). Table 4.3 presents the six principal components (PCs) that were extracted that had eigen values greater than one using the Kaiser criterion. These six PCs explained 67.2% of the total variation in the variables used. The different factors extracted represented different dimensions of the values households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal attach to forest resources. From these six PCs, the first three PCs were retained because they had eigen values greater than one and also allowed for meaningful interpretation of the PCs. The three PCs were defined and named using the relative component loadings. Absolute PC loadings greater than 0.50 were considered dominating following Nieuwoudt (1977).

Based on the dominant component loadings (Table 4.3), the first PC shows that households that attached high values on construction poles also attached high values on craftwork, traditional medicine, mushrooms, edible fruits, hunting, recreation and on the fact that forests are sanctuary or sacred place. The majority of the values, except sanctuary, are all associated with the utilization of forests for products and services that satisfy human wants and needs. Such values are referred to as anthropocentric values as opposed to bio-centric values, where households

attach values based on the worth of something as an end in itself, regardless of its usefulness to humans (McFarlane & Boxall, 2000). Thus, the first PC represented the anthropocentric values households attach to forest resources. It explained 25.1% of the variation in the variables included in the model. The results indicate that the households attached their most important values to forests by interpreting and regarding the forest in terms of human-centred values and experiences.

Table 4.2: The results of factor analysis to extract principal components

Component	Initial Eigen values		
	Total	**% of Variance**	**Cumulative %**
1	5.4	25.2	25.2
2	2.6	12.1	37.3
3	2.2	10.2	47.5
4	1.7	7.7	55.2
5	1.3	6.4	61.7
6	1.3	5.8	67.4
7	1.1	4.8	72.3
8	0.9	4.3	76.6
9	0.8	4.0	80.7
10	0.7	3.3	83.9
11	0.6	2.6	86.6
12	0.5	2.5	89.1
13	0.5	2.2	91.3
14	0.4	1.7	93.0
15	0.3	1.5	94.6
16	0.3	1.4	95.9
17	0.3	1.4	97.3
18	0.2	1.0	98.3
19	0.2	0.7	99.1
20	0.1	0.5	99.5
21	0.1	0.4	100.0

Source: Survey data (2011)

Table 4.3: Dimensions of the values sampled households attach to forest resources

Forest function	Principal component (Eigen value)					
	1	2	3	4	5	6
Burial logs	-0.015	0.016	0.006	-0.034	-0.015	-0.004
Firewood	0.246	0.159	0.029	0.074	-0.023	-0.006
Construction poles	**0.508**	0.342	0.052	0.026	0.044	-0.252
Electricity poles	0.212	0.144	**-0.836**	0.461	0.073	0.316
Craftwork	**0.735**	0.236	-0.472	0.142	-0.045	0.155
Medicine	**0.804**	0.437	-0.261	-0.870	**0.569**	-0.033
Mushroom	**0.557**	0.342	-0.209	0.047	-0.236	0.006
Edible fruits	**0.551**	0.455	-0.234	0.296	-0.262	0.044
Hunting	**0.622**	-0.160	0.055	**-0.517**	**-0.859**	0.143
Recreation	**0.517**	0.018	0.452	-0.147	-0.075	0.271
Bio-prospecting	0.413	-0.039	**0.514**	0.098	0.053	0.039
Habitat	0.489	0.072	0.210	0.187	-0.123	-0.096
Biodiversity	0.400	0.150	0.181	0.163	-0.055	-0.295
CO2 sequestration	0.416	0.001	**0.509**	0.366	0.164	0.208
Soil conservation	0.386	0.133	0.106	0.189	0.110	-0.058
Water quality	0.485	0.182	0.313	0.161	0.137	-0.140
Natural beauty	0.320	0.081	0.155	0.112	0.080	-0.031
Sanctuary	**0.967**	**-1.189**	-0.363	0.073	0.083	-0.457
Wildlife apprec.	0.374	0.020	0.151	0.182	0.073	-0.086
Heritage	0.454	0.114	0.177	0.020	0.061	-0.041
Burial sites	0.487	**-0.565**	0.104	-0.021	0.234	**0.766**

Source: Survey data (2011)

Note: Item scale: 1 = opposed to my values, 5 = very important.

The results of this study were different from the findings by Steel et al (1994) who examined the degree to which the public in the United States embraces differing values about federal forests nationally and regionally. Unlike this case study, their findings suggested strong bio-centric value orientations toward forests among the US public. However, the results are supported by several studies in South Africa that reported that most forest values are strictly utilitarian (Cocks et al, 2003; Dovie et al, 2002; Dovie, 2003; Shackleton & Shackleton, 2006; Shackleton & Shackleton, 2003; Shackleton, 2009; Shackleton et al, 2007; Twine et al, 2003). This has been

explained in the context of high levels of rural poverty which makes many households rely on forest products and services (Shackleton et al, 2007: Cocks et al, 2003; Twine et al, 2003). Such differences might be attributed to the fact that the communities in rural KwaZulu-Natal were low income groups as compared to more affluent communities in the United States. In South Africa, the poorest constitute 40 percent of the population and 74 percent of them live in rural areas (DWAF, 2005). It is, therefore, not surprising that in most households in rural South Africa, forest benefits that enhance their survival are much more important than environmental or bio-centric concerns. Hence, households in these rural South African communities view the forest as a means to enhance their survival.

The dominating variables in the second factor, which explained 12.1% of the variation in the variables, were sanctuary (-1.189) and burial sites (-0.565). The negative sign on these variables suggest that households that attach high values on forests because they function as burial sites and as sanctuaries or sacred places attach lower values to most other utilitarian forest functions. This component represented the cultural, moral or spiritual values households attach to forest functions. According to Infiel & Mugisha (2010), responses to the natural world stem as much from culturally and morally-based constructions of nature as they do from economics. Many local communities and indigenous people have cultural or moral value systems that link them to the natural world. If incorporated into conservation initiatives, these values have the power to imbue protected areas or resource management regimes with relevance for local cultures (Infiel & Mugisha, 2010). Thus, this PC was named cultural/moral/spiritual values.

The third component was dominated by electricity poles, bio-prospecting or research as well as carbon dioxide sequestration and explained 10.2% of the variation in the variables. The negative

sign on electricity poles suggest that households that attached high values to bio-prospecting and carbon dioxide sequestration attached less value to electricity poles. In the study areas, electricity pole lines were provided by the South African power utility company (Eskom) and hence, households were not directly utilizing trees as poles for electricity lines. However, households attached existence values to forests reflecting a sense of well-being of simply knowing that forests exist for the continued supply of electricity pole lines even in the future. They also attached values to forests since they would provide the option for bio-prospecting or further research in the future. This reflects that households also attached bequest values on forests. Both existence and bequest forest values are non-use values. Non-use values are connected with the prolonged existence of goods, without any kind of contemporary or planned use (Cavuta, 2006). Moreover, households also valued forest for the continued supply of clean air. Option values refer to potential direct and indirect use values which might be realized in the future (Bishop, 1999). According to this view, households in the studied areas of KwaZulu-Natal realize that there might be a premium on preserving forest ecosystems for future uses. Thus, this PC was named 'non-use/option values'.

The fourth component was dominated by hunting only. The fifth PC was dominated by traditional medicine and hunting. The negative sign on the variable hunting indicates that those households that attached high values to traditional medicine attached less value to hunting. The sixth PC was dominated by burial logs only. No distinct economic meaning could be attached to the last three PCs. In addition, these PCs combined, explained only 19.9% of the total variation in the variables used and were, thus, not used for further regression analysis.

4.4 Factors influencing the values households attach to forest resources

Ordinary Least Squares regression was initially used to examine the factors influencing the different dimension of the values households attach to forest resources. The first three composite indices or factors representing the values households attach to forest resources were regressed against other socio-economic and institutional variables. The F-statistics for all the OLS regression models were significant at the 5% level of significance. However, the goodness of fit (R^2 value) was low (below 0.5) in all the regressions (*see appendix 3, 4 & 5*). These results are typical of studies of human resource use. Godoy et al (1998) and Coomes et al (2000) also found similar results in their studies on predicting the causes of forest degradation. Such low goodness of fit (R^2 value) reflects the difficulty inherent in predicting human behavior due to the multitude of potentially confounding socio-economic variables and the complexity of interactions between them (Coomes et al, 2000).

The application of OLS also allowed for testing multicollinearity, heteroskedasticity and autocorrelation. There was no multicollinearity among the explanatory variables used in all the three OLS regressions since the variance inflation factors (VIF) for all variables were less than the critical value of 10, while all the tolerance factors were close to one (Gujarati & Porter, 2009) (Table 4.4). All the three functions showed no signs of serial correlation as the Durbin Watson (DW) statistics of 1.9, 1.58 and 1.8 were within the lower (D_L= 1.44) and upper (D_U = 2.04) boundaries, from the DW table (Table 4.6). However, there was heteroscedasticity in the all the OLS models to determine the factors influencing the values households attach to forest resources since the calculated χ^2 values (i.e., 4.60, 8.46 and 8.64) were larger than the tabulated χ^2 value (3.84) at 5% significance level and one degree of freedom (Table 4.5). Thus, Generalized Least

Squares (GLS), instead of OLS, was further applied for the later two estimations. The results of the estimated GLS regressions are presented in Table 4.6.

Table 4.4: Diagnostics to assess the degree of multicolinearity

Variable	**Collinearity Statistics**					
	Anthropocentric		Cultural/moral values		Non-use/option values	
	VIF	Tolerance	VIF	Tolerance	VIF	Tolerance
AGE	1.84	0.54	1.93	0.52	1.9	0.53
GENDER	1.5	0.67	1.30	0.77	1.32	0.76
HHOLD_SIZE	1.92	0.52	1.69	0.59	1.68	0.59
MARITIAL_STAT	1.67	0.6	1.41	0.71	1.4	0.72
EMPLOYNT_STAT	1.58	0.63	1.40	0.71	1.37	0.73
LEVEL_OF_EDUC	2.78	0.36	2.33	0.43	2.37	0.42
LEADRSHP_PSTN	1.24	0.81	1.13	0.88	1.15	0.87
FARM_ACTIVITY	1.43	0.7	1.41	0.71	1.4	0.72
EMPLYD_MEMB	1.26	0.79	1.22	0.82	1.24	0.81
DIST_TO_FOREST	1.31	0.76	1.27	0.79	1.24	0.81
SEL_FRST_PRDS	1.61	0.62	-	-	1.69	0.59
ACCESS_TO_ELEC	3.07	0.33	8.16	0.12	8.31	0.12
INCOM_AB_MEAN	1.6	0.62	1.42	0.70	1.49	0.67
TOT_SOC_GRANT	1.98	0.5	1.72	0.58	1.78	0.56
ALTRNATIVE_SRCS	1.45	0.69	1.34	0.74	1.29	0.78
ENVIRONT_AWAR	1.35	0.74	1.24	0.81	1.3	0.77
HH_PART-STAT	1.41	0.71	1.34	0.74	1.36	0.74
NO_OF_HDLOAD	1.26	0.8	-	-	-	-
HARV_PROHIB	-	-	1.20	0.83	1.17	0.85
CULTR_BENEFITS	-	-	1.40	0.71	-	-
D1	1.62	0.62	1.17	0.86	1.24	0.8
D2	-	-	7.54	0.13	7.91	0.13
Mean VIF	**1.68**		**2.08**		**2.13**	

Source: Survey data (2011)

- means variable has not been used in the GLS regression

Table 4.5: Results of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity Ho: Constant variance			
Variable	**χ^2 (1)**	**Prob > χ^2**	**tabulated χ^2 value**
ANTHROPCNTRIC_VAL	4.60	0.0319**	3.84
CULTURAL_VAL	8.46	0.0036***	3.84
NON_USE_VAL	8.64	0.0033***	3.84

Source: Survey data (2011)

Notes: *, **, *** means statistically significant at the 10, 5 and 1% levels, respectively

The sample size of 153 households was greater than 40 and was, therefore, considered a large sample. Following the correction for heteroscedasticity, the coefficient estimates for all the three models were considered unbiased and consistent (Gujarati & Porter, 2009).

4.4.1 Factors influencing the anthropocentric values households attach to forests

Table 4.6 provides the GLS regression outputs showing the socio-economic factors that influence the anthropocentric values (ANTHROPCNTRIC_VAL) households attach to forest services. Distance to the forest (DIST_TO_FOREST) and higher household income level (INCOM_AB_MEAN) significantly and negatively influence the anthropocentric values households attach to forests. On the other hand, households that were obtaining more headloads of firewood per week (NO_OF_HDLOAD) from the forests and those with high levels of environmental awareness (ENVIRONT_AWAR) were attaching significantly higher anthropocentric values to forests.

Table 4.6: GLS regression results

Variable	Type of values								
	Anthropocentric			Cultural/moral/spiritual values			Non-use/option values		
	Coef.	Std. Error	Sig.	Coef.	Std. Error	Sig.	Coef	Std. Error	Sig.
AGE	-0.01	0.01	0.32	**-0.1****	0.1	0.01	-0.01	0.01	0.16
GENDER	0.19	0.21	0.37	**-0.5****	0.19	0.01	**-0.38***	0.19	0.05
HHOLD_SIZE	0.02	0.03	0.48	-0.03	0.03	0.38	0.01	0.03	0.63
MARITAL_STAT	-0.09	0.2	0.65	**0.42****	0.18	0.02	**0.38****	0.19	0.04
EMPLOYNT_STAT	0.14	0.29	0.62	0.38	0.25	0.12	-0.07	0.25	0.77
LEVEL_OF_EDUC	0	0.03	0.97	**0.05****	0.02	0.03	-0.02	0.02	0.45
LEADRSHP_PSTN	0.07	0.32	0.82	0.16	0.26	0.54	-0.29	0.25	0.26
FARM_ACTIVITY	0.36	0.23	0.12	0.14	0.24	0.57	0.02	0.24	0.95
EMPLYD_MEMB	0.09	0.12	0.45	-0.08	0.11	0.47	-0.05	0.11	0.68
DIST_TO_FOREST	**-0.02****	0.01	0.03	0.004	0.004	0.34	0.01	0.04	0.8
SEL_FRST_PRDS	0.07	0.29	0.82	-	-	-	0.22	0.32	0.48
ACCESS_TO_ELEC	-0.08	0.53	0.88	-0.12	0.45	0.79	-0.16	0.45	0.73
INCOM_AB_MEAN	**-0.50****	0.23	0.03	0.34	0.21	0.12	0.2	0.23	0.36
TOT_SOC_GRANT	2.1E-6	1.E-4	0.85	1.1E-5	1.0E-5	0.29	0	0	0.38
ALTRNTIVE_SRCS	0.24	0.22	0.27	**-0.4****	0.23	0.06	**-0.38***	0.23	0.1
ENVIRONT_AWAR	**0.18****	0.07	0.01	-0.03	0.06	0.61	-0.04	0.06	0.49
HH_PART-STAT	0.05	0.2	0.8	0.19	0.19	0.3	-0.17	0.2	0.38
NO_OF_HDLOAD	**0.13****	0.07	0.07	-	-	-	-	-	-
HARV_PROHIB	-0.01	0.21	0.98	**0.36****	0.19	0.06	-0.28	0.19	0.14
CULTR_BENEFITS	-	-	-	0.12	0.19	0.52	0.07	0.2	0.72
D1	-0.2	0.56	0.76	-0.4	0.44	0.37	-0.38	0.46	0.41
D2	0.3	0.49	0.54	-0.12	0.45	0.79	-0.16	0.46	0.73
_cons (D3)	-0.72	0.51	0.16	0.39	0.5	0.45	**1.32****	0.51	0.01
R2 value			0.4			0.32			0.30
F.sig			0			0			0
Durbin Watson d test			1.9			1.58			1.8

Source: Survey data (2011)

Notes: *, **, *** means coefficient is statistically significant at the 10, 5 and 1% levels, respectively

- means the variable has not been used in the OLS regression

The parameter estimate for the distance to the forest (DIST_TO_FOREST) was negative and significant. Households located further away from the forest attached low anthropocentric values to forests. This is mainly because the distance to the forest affects the resource use intensity of rural forest users. The collection of forest products and transportation to the household often becomes costly as households become further away from the forest. Thus, households close to the forest realise more utilitarian benefits and hence attach higher anthropocentric value to the forest than those further away from the forest (Barnham et al, 1999). Kerapeletswe & Lovett (2002) found similar results in Botswana. They argued that distance involves walking and carrying the harvest resulting in increasing difficulty in the collection of forest products and hence less value attached to those forest products.

The parameter estimate for above average income (INCOM_AB_MEAN) was negative and highly significant. This suggests that households getting above average annual income attached less anthropocentric values to forest products and services. According to Wickramasinghe et al (1996), the dependency on forest resources reduces with increase in family income. High levels of income as well as affluence have been linked with households attaching more bio-centric values and less anthropocentric values. In a study by McFarlane & Boxall (2000), dependence on the forest sector for economic livelihood had a positive association with the anthropocentric score and a weak negative association with the bio-centric score. Most households in the studied areas of KwaZulu-Natal were generally low income households. However, those households that had above average annual household income depended less on forests and hence attached little anthropocentric values to forests.

Hoseholds that were harvesting more number of headloads of firewood per week from the forests also attached significantly higher anthropocentric values to forest products and services. The parameter estimate for number of headloads extracted by a household per week (NO_OF_HDLOAD) from the forest was positive and statistically significant. In a study by McFarlane & Boxall (2000), the dependence on the forest sector for economic livelihood had a positive association with the anthropocentric score and a weak negative association with the bio-centric score. Similarly, households that harvested more number of headloads of firewood per week were more dependent on forest for firewood as an energy source and hence, attached more anthropocentric values to forests compapred to households that were less dependent on firewood. Such anthropocentric value orientations can also be explained by the fact that the studied households were rural residents. According to a study by Steel et al (1997), urban dwellers often attach bio-centric values to forests while rural households attach anthropocentric values. This is largely influenced by the higher dependency on forest resources of rural households compared to households in urban areas.

The parameter estimate for environmental awareness (ENVIRONT_AWAR) was positive and statistically significant. Thus, household heads with higher levels of environmental awareness (ENVIRONT_AWAR) attached more anthropocentric values to forests. This was not according to theory and findings from other studies. According to Tarrant & Cordell (2002) individuals with higher levels of environmental awareness and those that have previously worked in organisations that deal with natural resources conservation and protection are more sympathetic to the non-use and bio-centric values of the natural environment. In this study, household heads with higher levels of environmental awareness attached more anthropocentric values to forests

probably because they were more dependent on forest products and services and hence were also aware of the benefits and uses they derive from forests. Moreover, despite such high levels of environmental awareness, the majority of these rural households was poor and, hence, viewed forests from a more utilitarian perspective since survival is more important than recreational or other bio-centric values, in such communities.

Household heads with higher education levels were expected to attach high bio-centric values and less anthropocentric values (Vaske et al, 2001). However, the parameter estimate for the level of education was not statistically significant. Likewise, household engagement in crop production was expected to reduce household's dependence on forests for survival. However, the parameter estimate for households involved in farming activity was also not statistically significant. On the other hand, income in the form of subsidies is expected to reduce the anthropocentric values households attach to forest functions. However, the parameter estimates for the total value of social grants received by households was not statistically significant.

4.4.2 Factors influencing the cultural/moral/spiritual values households attach to forests

The cultural/moral/spiritual values households attach to forest resources were positively associated with household heads being married (MARITAL_STAT = 1), income above mean value (INCOM_AB_MEAN) and level of education (LEV_OF_EDUC). Older people attached less cultural/moral/spiritual values on forests than younger people. In addition, male-headed households (GENDER = 1), households getting forest products from alternative forests (ALTRNTIVE_SRCS = 1) and households dissatisfied with being prohibited (HARV_PROHIB

= 1) from harvesting from the community-managed forests also attached significantly less cultural/moral/spiritual values to forest resources.

Consistent with the study by Tarrant & Cordell (2002), women in the studied areas of KwaZulu-Natal exhibited pro-non-utilitarian/non-instrumental value orientation compared to men. The parameter estimate for GENDER was negative and statistically significant. Younger persons have also been reported to have higher non-utilitarian values of forests than their older counterparts (Tarrant & Cordell, 2002). Likewise, the parameter estimate for household head's age was negative and statistically significant indicating that older household heads in these studied areas of KwaZulu-Natal attached less cultural/moral/spiritual values to forests than younger household heads. This was unexpected in these rural communities. In the Zulu culture, generally, older people tend to have more cultural/moral/spiritual values than younger people. This anomaly observed, with regards to cultural/moral/spiritual values attached to forests could only be explained by the fact that cultural/moral/spiritual values are basically non-utilitarian forest values. In these rural areas of KwaZulu-Natal, the responsibilities associated with providing for the family, because of division of family roles (Tarrant & Cordell, 2002) are more for men and older people. Hence, men and older people are more likely to view the forest as a source of revenue creation and means of livelihood and not cultural/moral/spiritual uses (Newmark et al, 1993).

High income households and those with highly educated household heads have also been reported to have a non-utilitarian value orientation than low income and with less educated household heads. Education enhances individual's income earning opportunities and capacity enabling households to be less dependent on forests (Wickramasinghe et al, 1996). The

parameter estimates for above average household income (INCOM_AB_MEAN) and level of education (LEV_OF_EDUC) were positive and statistically significant. Such non-utilitarian/non-commodity orientations towards forests can be interpreted within the context of an emerging post-material society, in which a non-instrumental orientation to forests and the natural environment may be favored more by young, better income earning and educated household heads (Tarrant & Cordell, 2002). It is also not surprising that household heads who were using alternative sources to get forestry products were attaching high anthropocentric values but less cultural/moral/spiritual values. The parameter estimate for alternative forests (ALTRNTIVE_SRCS) indicates a positive relationship with anthropocentric values but a negative relationship with cultural/moral/spiritual values. This means that those households that view the forests as a means to meet human needs attach little values to the other non-utilitarian uses such as cultural/moral/spiritual values. This was also indicated in the component loadings for the PC representing cultural/moral/spiritual values (Table 4.2). The component loadings for the dominant variables (*i.e.*, burial sites and sanctuary) in this PC had negative signs while the loadings for most utilitarian forest functions had positive signs.

4.4.3 Factors influencing the non-use/option values households attach to forests

The non-use/option values households attach to forest products and services were significantly influenced by the gender of the household head (GENDER), marital status (MARITAL_STAT) and household dependency on forests (*i.e.*, use of alternative forests). Since non-use/option values of forests are also non-instrumental forest values, the negative and statistically significant parameter estimate for the gender of household head (GENDER) further confirms that women in the studied rural communities attach more non-instrumental values than men. Likewise the,

negative and statistically significant parameter estimate for household use of alternative forests also further supports the fact that households that were more depended on the forest, to the extent of using alternative forests, viewed the forest with a utilitarian perspective and attached less non-utilitarian values (*i.e.*, non-use/option) to forests. At the same time, those who were married attached more option/non-use values. This means that those who were married were probably becoming more considerate to their siblings and the future generations. This is supported by the fact that 67.3% of those who were married indicated that the forests were their heritage and were willing to conserve them for the future generations.

4.4.4 The effect of area/geographical differences on the values households attach to forests

A portion of the variance in the anthropocentric values attached to forests may be explained by variables related to community or area features (Shindler & Cramer, 1999). In this study, no area/geographical differences significantly influenced the anthropocentric or cultural/moral/spiritual values households in the three communities attached to forests. The parameter estimates for the area dummies (D1, D2 and D3) were not statistically significant in the GLS regressions to estimate the anthropocentric and cultural values households attach to forest products and services. However, the parameter estimate for D3 was positive and statistically significant in the GLS regression model to estimate the non-use/option values households attach to forests. The positive and statistically significant parameter estimate for D3 means that households in the Gudwini community (D3 = 1) significantly attached more non-use or option values to forest than the other two communities. The main differences between the Gudwini community and the other two communities were that it had no electricity and was managing a natural forest while the other communities were managing plantations. Thus, the

community managing a natural forest attached higher cultural/moral/spiritual values than those managing plantations. This is because plantations are established with commodity-oriented and economic expectations while natural forests allow human beings to realize non-commodity and non-instrumental values of forest (Tarrant & Cordell, 2002). Moreover, because there are more plant species in natural forests, there are more non-use/option benefits that can be realized from natural forest than on plantations. As a result, users of natural resources would attach more option/non-use values considering their future generations. Households in Gudwini, managing a natural forest, indicated that the forest was their heritage, and were willing to conserve it for the future generations.

The main distinct difference between New Reserve 1 (i.e., D1 = 1) and other two communities was that there were serious conflicts over the ownership, appropriation and management of the forests. However, these conflicts did not negatively influence the anthropocentric values households attach to forest products and services. Although the theory of reasoned action suggests that behaviour is also influenced by more subjective societal norms and social pressures, the presence of CBFM conflicts in New Reserve B did not result in dissatisfaction, negative attitude towards forest and low values being attached to forest products and services (Shindler & Cramer, 1999).

4.5 Factors influencing household decision to participate in CBFM

Table 4.7 shows the distribution of households according to their participation status. It also shows the results of the independent t-test for the differences in sample means for the key continuous variables explaining household participation status. A description of the explanatory variables used is provided in chapter 3 (*see Table 3.3*). Households that were already

participating had statistically significantly higher levels of environmental awareness (ENVIRONT_AWA) compared to those that were not willing to join and participate. Moreover, the average household size (HH_SIZE) was significantly larger for households that were already participating in CBFM than for those that were in the 'willing to join and participate' category. The mean household size (HH_SIZE) was also statistically and significantly higher for households that were already participating than those that were not willing to join and participate.

The chi-squared test of independence of categorical variables is used to determine whether the effects of one variable depend on the value of another variable (Sharp, 1979). In this study, it was used to test if the participation status of each household depended on the household head's gender, marital and employment status, perception of degradation, or on whether the household had income above average, access to electricity, involved in farming, used alternative forests or selling forest products. A description of the explanatory variables used is provided in chapter 3 (*see Table 3.3 & 3.4*). The statistically significant chi-squared value for the gender of the household head means that household's participation status was influenced by household head's gender. Likewise, income above average, perception of degradation and household selling of forest products significantly influenced households to be in one of the three participation categories (Table 4.8). Thus, the MNL was further employed to predict the household's participation status as a function of these explanatory variables that described the characteristics of each household.

Table 4.7: Independent t-test for key continuous variables affecting household participation status

Explanatory variable	n	Mean	SD	Sig. (2-tailed)
DIST_TO_FOREST				.473
'Already participating'	40	24.08	21.51	
"Willing to join and participate'	54	21.09	18.51	
DIST_TO_FOREST				.287
'Already participating'	40	24.08	21.51	
"Not willing to join and participate'	62	19.68	19.43	
ENVIRONT_AWA				.043**
'Already participating'	40	3.35	1.53	
"Willing to join and participate'	54	2.78	1.50	
ENVIRONT_AWA				.209
'Already participating'	40	3.35	1.53	
"Not willing to join and participate'	61	2.92	1.77	
LEVEL_OF_EDUC				.514
'Already participating'	40	5.30	4.64	
"Willing to join and participate'	54	5.94	4.78	
LEVEL_OF_EDUC				.386
'Already participating'	40	5.30	4.64	
"Not willing to join and participate'	62	4.48	4.62	
HH_SIZE				.031**
'Already participating'	40	7.68	3.68	
"Willing to join and participate'	54	6.22	2.77	
HH_SIZE				.036**
'Already participating'	40	7.68	3.68	
"Not willing to join and participate'	62	6.24	3.07	
TOT_SOC_GRANT				.535
'Already participating'	40	14598.00	11220.72	
"Willing to join and participate'	54	13317.04	8719.03	
TOT_SOC_GRANT				.885
'Already participating'	40	14598.00	11220.72	
"Not willing to join and participate'	62	14873.55	8012.34	
AGE				.227
'Already participating'	40	54.63	16.78	
"Willing to join and participate'	54	50.22	17.75	
AGE				.869
'Already participating'	40	54.63	16.78	
"Not willing to join and participate'	62	53.98	20.56	

Source: Survey data (2011)

Notes: *, **, *** means statistically significant at the 10, 5 and 1% significance

Table 4.8: Chi-squared test for the difference in frequencies between dichotomous variables explaining household participation status

Household characteristics	Household participation status			Overall	χ^2 test
	Participating	Willing to participate	Not willing to participate		
Gender					0.002**
Male	19(47.5)	8(14.8)	16(25.8	43(27.2)	
Female	21(52.5)	46(85.2)	46(74.2)	113(71.5)	
Marital status					0.060*
Married	25(62.5)	26(48.1)	43 (69.4)	94(59.2)	
Other	15(37.5)	28(51.9)	19(30.6)	62(39.2)	
Employment status					0.473
Employed	4(10.0)	10(18.5)	8(12.9)	22(13.9)	
Unemployed	36(90.0)	44(81.5)	54(87.1)	134(84.8)	
Income above mean					0.081*
Above average	13(32.5)	10(18.5)	53(85.5)	32(20.3)	
Below average	27(67.5)	44(81.5)	9(14.5)	124(78.5)	
Access to electricity					0.619
Has electricity	29(72.5)	34(63)	42(67.7)	51(32.3)	
No electricity	11(27.5)	20(37.0)	20(32.3)	105(66.3)	
Farm activity					0.255
Engage in farming activities	37(92.5)	45(83.3)	50(80.6)	132(83.5)	
No farming activity	3(7.5)	9(16.7)	12(19.4)	24(15.2)	
Alternative forests					0.262
Alternative forests	31(77.5)	11(20.4)	55(88.7)	129(81.9)	
No alternative forests	9(22.5)	43(79.6)	7(11.3)	27(17.1)	
Perception of degradation					0.017**
No degradation	27 (67.5)	32(59.3)	25(40.3)	84(53.2)	
Degradation present	13(13.5)	22(40.7)	37(59.7)	72(45.6)	
Selling forest products					0.065*
Selling	7(17.5)	2(3.7)	5(8.1)	14(9.0)	
Not selling	33(82.5)	52(96.3)	57(91.9)	142(91.0)	

Source: Survey data (2011)

Notes: *, **, *** means statistically significant at the 10%, 5% and 1% level, respectively and numbers in brackets are percentages

4.5.1 Goodness-of-fit of the MNL model

Table 4.9 presents the Multinomial Logit Model (MNL) empirical results generated to identify the important factors influencing the participation status of households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal. It shows the household characteristics and other institutional factors that influence the probability that a given household was 'already participating', 'willing to join and participate' or 'not willing to join and participate'. Following Maddala (1983) who argued that the reference category is usually the one that makes most sense (*i.e.*, is of most interest) to the researcher, the category 'already participating' was chosen as the reference category.

The overall goodness of fit of the MNL to the data was assessed using the Pearson $\chi 2$ or Deviance $\chi 2$ statistic with the associated degrees of freedom. Both the estimated Pearson $\chi 2$ and Deviance $\chi 2$ with 144 degrees of freedom were statistically significant at well above 5% level (Table 4.10), indicating that the MNL adequately fits the data well. Moreover, the estimated $\chi 2$ statistic of 91.1 with 50 degrees of freedom was statistically significant at 1% level. The overall classification accuracy (*i.e.*, the percentage of correct and incorrect household participation status) of this MNL was 72.2% with 'already participating', 'willing to join and participate' and 'not willing to join and participate' correctly classified as 63.0%, 71.4% and 78.3%, respectively (Table 4.10). According to Pedhazur (1997) cited by Garson (2009), since the parameter estimates in MNL are estimated by the method of maximum likelihood, the MNL assumes that large samples of data are used. Otherwise, the estimated standard errors for the estimated parameter estimates may be relatively high. However, the standard errors in both the first and second contrast were below two, indicating that micronumerosity (small sample size) was not a problem in this study (Table 4.9).

Table 4.9: Coefficient estimates for the MNL model to estimate the factors influencing household participation status

Variable	Odds contrast					
	In(P2/P1) /Contrast 1			In(P3/P1)/ Contrast 2		
	Coeff.	Stand. Error	Odds ratio	Coeff	Stand. Error	Odds ratio
Intercept (D3)	-7.75	8.24	0.0004	0.81	7.65	2.25
AGE	-0.05	0.03	0.95	**-0.07****	0.03	0.93
GENDER	**2.27****	1.10	9.68	**1.44***	0.89	4.22
MARITAL_STAT	**1.93***	1.11	6.88	-0.28	1.00	0.76
LEVEL_OF_EDUC	0.15	0.14	1.16	-0.17	0.12	0.84
HHOLD_SIZE	**-0.80****	0.36	0.44	**-1.0*****	0.35	0.37
ABOVE_15	**0.66***	0.41	1.92	**0.83****	0.39	2.29
EMPLOYNT_STAT	**-3.09***	1.74	0.05	-2.71	1.71	0.06
EMPLYD_MEMB	0.87	0.85	2.39	0.93	0.83	0.27
INCOM_AB_MEAN	**2.90****	1.30	18.2	1.79	1.21	5.99
TOT_SOC_GRANT	**0.001*****	0.001	1.00	**0.001****	0.00	1.00
ACCESS_TO_ELEC	1.62	6.59	5.05	-0.42	6.39	0.65
DIST_TO_FOREST	-0.04	0.04	0.96	**-0.09****	0.04	0.91
FARM_ACTIVITY	1.21	1.57	3.35	1.40	1.42	4.05
SELL_FOR_PRDCT	**5.77*****	1.77	320.5	**3.20****	1.44	24.5
ALTRNATIVE_SRCS	-1.15	1.21	0.32	**-2.85****	1.15	0.06
NO_OF_HEADLOADS	**1.13****	0.45	3.09	0.55	0.40	1.73
ENVIRONT_AWAR	0.08	0.36	1.08	-0.02	0.31	0.98
PERCPTN_OF_DEGRAD	-0.81	0.96	0.44	**-1.12***	0.88	0.33
PRESERV_OR_UTILISN	**-2.03****	1.20	0.13	**-2.28***	1.28	0.10
CLARITY_OF_RULES	-0.79	1.14	0.45	-0.35	0.91	0.70
ANTHROPCNTRC_VAL	**-2.10****	0.81	0.12	0.23	0.60	1.25
CULTURAL_VAL	-0.03	0.72	0.97	**-1.79****	0.74	0.17
NON_USE_VAL	-0.05	0.49	0.95	-0.27	0.50	0.76
D1	1.57	6.68	4.81	4.08	6.64	59.15
D2	0.69	6.49	1.99	0.09	6.30	1.09

Source: Survey data (2011)

Notes: *, **, *** means coefficient is statistically significant at the 10, 5 and 1% significance

Contrast 1 = (Participating vs Willing to join and participate).

Contrast 2 = (Participating vs Not willing to join and participate).

P_1 = the probability that the i^{th} household is 'already participating' in CBFM

P_2 = the probability that the i^{th} household is 'willing to join and participate'

P_3 = the probability that the i^{th} household is 'not willing to join and participate'

Table 4.10: Goodness-of-fit statistics for the MNL model

Goodness-of-Fit			
Measure	Chi-Square	df	Sig.
Chi-squared ($\chi 2$)	91.1	50	0.000
Pearson $\chi 2$	153.6	144	0.278
Deviance $\chi 2$	138.1	144	0.622
Classification accuracy			
Observed	**Predicted**		
	Participating	Willing to join and participate	Not willing to join and participate	Percent Correct
Participating	17	3	7	63.0%
Willing to join and participate	3	25	7	71.4%
Not willing to join and participate	4	6	36	78.3%
Overall Percentage	22.2%	31.5%	46.3%	72.2%

Source: Survey data (2011)

One of the main assumptions of the MNL model is that there is no multicollinearity among the explanatory variables. Any other variable that is not one of the independent variables can be used as the dependent variable in a linear regression with all the other independent variables to assess multicollinearity in a MNL model. The collinearity diagnostic statistics are based on the independent variables only, and hence, the choice of the dependent variable would not matter (Field, 2009). In this study, the number of school going children was used as the dependent variable in an OLS regression against all the other explanatory variables used in the MNL model. Zero-order or pair-wise correlations and variance inflation factors were generated to check

multicollinearity. Both analyses indicated no multicollinearity that may adversely affect the regression estimates (Table 4.11).

Table 4.11: Zero-order or pair-wise correlations and VIFs used to detect multicollinearity among explanatory variables in the MNL regression

Explanatory variable	Correlations			Collinearity Statistics	
	Zero-order	Partial	Part	Tolerance	VIF
Intercept					
AGE	-0.13	-0.03	-0.02	0.51	1.95
GENDER	0.14	0.12	0.09	0.63	1.58
MARITIAL_STAT	0.23	0.18	0.13	0.54	1.86
LEVEL_OF_EDUC	-0.14	-0.07	-0.05	0.33	3.02
HHOLD_SIZE	0.24	0.01	0.00	0.14	6.97
ABOVE_15	0.21	0.03	0.02	0.20	4.90
EMPLOYNT_STAT	0.02	-0.01	-0.01	0.66	1.52
LEADRSHP_PSTN	-0.01	-0.05	-0.04	0.73	1.38
EMPLYD_MEMB	0.09	-0.06	-0.04	0.76	1.32
INCOM_AB_MEAN	0.28	0.14	0.10	0.55	1.80
TOT_SOC_GRANT	0.21	0.01	0.00	0.42	2.38
ACCESS_TO_ELEC	-0.30	-0.01	-0.01	0.27	3.77
DIST_TO_FOREST	0.19	0.11	0.08	0.60	1.66
FARM_ACTIVITY	0.13	0.04	0.03	0.60	1.67
SEL_FRST_PRDS	0.38	0.31	0.23	0.51	1.96
ALTRNTIVE_SRCS	0.11	0.14	0.10	0.64	1.56
NO_OF_HDLOAD	0.01	0.17	0.12	0.69	1.44
ENVIRONT_AWA	0.29	0.24	0.17	0.63	1.59
PERCEPTN_OF_DEGRAD	-0.09	-0.06	-0.04	0.68	1.46
PRESRVTN_OR_UTILSTN	-0.32	-0.27	-0.19	0.61	1.63
CLARITY_OF_RULES	0.18	0.20	0.14	0.75	1.33
SRCE_OF_CBFM_CONTR	-0.21	0.01	0.01	0.53	1.90
CBFM_CONFLICTS	-0.28	-0.18	-0.13	0.56	1.78
ANTHROPCNTRIC_VAL	-0.06	-0.02	-0.02	0.55	1.81
CULTURAL_VAL	0.19	0.03	0.02	0.72	1.38
NON_USE_VAL	0.09	-0.16	-0.12	0.68	1.46

Source: Survey data (2011)

4.5.2 Values households attach to forests and participation in CBFM

In this study, one of the objectives was to determine if the values households attach to forest resources influence their decision to participate in CBFM. The coefficient estimates for the anthropocentric values (ANTHROPCNTRIC_VAL) and cultural values (CULTURAL_VAL) (*i.e.*, composite indices from PCA) in the first and second contrast, respectively, were negative and statistically significant. This indicates that the anthropocentric and cultural/moral/spiritual values households attach to forest resources were influencing their decision to participate in CBFM. It was less likely that a household was in the category 'willing to join and participating' than the 'already participating' category if they attached high anthropocentric value to forests. Likewise, a household was less likely to be in the category 'not willing to participate' if they attached high cultural/moral/spiritual values to forests. Thus, households that attached more anthropocentric or cultural/moral/spiritual values to forests were more likely to participate in CBFM. The estimated odds ratio for the continuous variable anthropocentric values (ANTHROPCNTRIC_VAL) is 0.12. This suggests that the odds of a household being in the 'willing to join and participate' rather than 'already participating' (*i.e.*, P_2/P_1) falls by 0.12 when the anthropocentric values households attach to forest resources increases by one unit (Table 4.9).

Contemporary exchange theory stresses that farmers seek the ''best value'' when participating in forest management programs (Napier et al, 1986). Consistent with this exchange theory, rural households tend to participate in programs that have positive net benefits (Dolisca et al, 2006). Likewise, the statistically significant parameter estimates for the anthropocentric and cultural/moral/spiritual values households attach to forest resources supports this notion. As rural farmers seek the best value in conservation programs, they tend to choose forestry activities that

offer at least as much socio-economic and environmental benefits, as they get from alternate activities (Dolisca et al, 2006). Thus, the studied participating rural households were getting the best value in conservation programs in accordance with Dolisca et al (2006), by choosing forestry activities that offered them at least as much anthropocentric and cultural/moral/spiritual values, as they get from alternate activities. The results are also consistent with Robson et al (1996) who argued that if local people attach more value on the products and services provided by forests, they will be motivated to modify their resource and land use practices and to invest in time and effort in forest conservation activities.

According to McFarlane & Boxall (2000), bio-centric oriented individuals are more likely to support protection-oriented management strategies while anthropocentric-oriented individuals are more likely to support traditional timber production. The fact that the parameter estimate for anthropocentric values was significant in this study could thus, be explained by the fact that the majority (66.6%) of the sample (KwaSobabili and New Reserve) were managing plantations which were established specifically for traditional timber production. These findings, therefore, are consistent with the cognitive hierarchy model since the results show that values individuals attach to forest resources are closely associated with higher order cognitions that reflect forest management and policy preferences (Dolisca et al, 2006). The majority of those who were participating in managing plantations in KwaSobabili and New Reserve B (60.2%) were aspiring to expand these plantations into viable timber production enterprises. Although they were not yet receiving income from these forests, they looked forward to developing a viable income generating business that would create employment for their communities.

The negative and statistically significant parameter estimate for cultural/moral/spiritual values households attach to forest resources (CULTURAL_VAL) in the second contrast supports the argument by Nasi et al (2002) that cultural/moral/spiritual values influence the way people react and behave in relation to woodland access and management. The odds ratio for the continuous variable (CULTURAL_VAL) is 0.17 and suggests that the odds of a household being unwilling to participate in CBFM rather than being 'already participating' fall by 0.17 when the cultural/moral/spiritual values attached to forests increases by one unit.

According to Infiel & Mugisha (2010) cultural values and social constructions of nature are at the centre of the relationships between nature and communities. It is precisely these cultural/moral/spiritual values, rooted in intuitive and emotional experiences that have even motivated many people to take legal and political action against forest managers (Bengston et al, 1999). Thus, these results support Infiel & Mugisha (2010) who argued that forest resources are not just economic entities and, therefore, policy makers should also recognise the non-market forest values in defining policies on CBFM. Likewise, Borrie et al (2002) also argued that the religious significance of the forest to local groups reveals the degree of commitment they may have in sustaining these threatened ecosystems through local participation. This is because forests contribute to cultural identity of a society. In Gudwini, where the community was managing a natural forest, most households indicated that forests were their heritage and hence the need to protect them. Some cultural objects such as graveyards were also situated in forests while some tree species were believed to protect households from being struck by lightening.

In the study communities, participation was mainly for non-market forest benefits since only eleven households (7.1%) indicated that they were selling products from the community

managed forests. Using PCA, Dolisca et al (2006) found that participation can also be categorized into social participation, ecological participation or economic participation depending on the main incentives behind participation. Rural residents may be more concerned about the social participation (*i.e.*, doing an activity for the purpose of being with others, helping others or contributing to society) and prefer that the state pursue forestry programs that will stabilize and strengthen local communities (Dolisca et al, 2006). Similarly, households in the studied communities that attached more anthropocentric and cultural/moral/spiritual values were more likely to participate in CBFM, but for different reasons. Therefore, these findings illustrate the need to consider all possible types of forest values before making recommendations on community forest management, since some households can be participating for the non-market values of forests.

4.5.3 Socio-economic and institutional factors affecting household participation status

Social and economic factors influence household decisions to participate in various community collective activities (Degeti, 2003). The age of the household head was among the demographic factors influencing the participation status of households. The negative and statistically significant coefficient for age of household head in the second contrast means that a household was less likely to be in the 'not willing to join and participate' category than to be in the 'already participating' category as age increases. This implies that older household heads were more likely to participate in CBFM than younger ones. This is consistent with the findings of Maskey et al (2003) in Nepal who observed that older people tend to participate more in community forestry programs than younger people. This was attributed to the fact that older people are retired and face lower opportunity cost of their time in participating in CBFM programs. The

results are different from Dolisca et al (2006) who found that older people were mainly interested in collecting forest resources while young people were willing to participate and contribute to the process of decision-making affecting forestry programs. In this study, older household heads were more likely to participate in CBFM, *ceteris paribus*, because their opportunities to be employed in towns and cities were more limited than younger people. Thus, the opportunity cost of their time to participate in CBFM was very low (Thoai & Ranola, 2010).

In the study communities, household participation status was also influenced by the gender of the household head. The parameter estimate for the gender of household head (GENDER) in both the first and second contrast was positive and statistically significant. This implies that male-headed households were more likely to be in the non-participating categories (*i.e.*, 'willing to join and participate' and 'not willing to join and participate') than being in the 'already participating' category. Thus, female-headed households were more likely to participate in CBFM than male-headed households. The estimated odds ratio for this dichotomous variable gender (GENDER) in the first contrast is 9.68 and suggest that the odds of the male household heads being in the category 'willing to join and participate' rather than 'already participating' (*i.e.*, P_2/P_1) were about seven times the odds of sampled female household heads being in the category 'willing to join and participate' rather than being 'already participating' (*i.e.*, P_2/P_1). Likewise, the estimated odds ratio for the dichotomous variable (GENDER) in the second contrast is 4.2 suggesting that the odds of sampled male household heads in the category 'not willing to join and participate' rather that already participating (*i.e.*, P_3/P_1) are about five times the odds of sampled female household heads being in the 'not willing to participate' category rather than already participating (*i.e.*, P_3/P_1).

Most empirical studies on women's participation in CBFM done in Nepal have cited the social context as one of the important factors affecting women's participation (Kalpana, 2009). However, the results in this study are different. Unlike the male-dominated society in Nepal, the South African rural societies have a relatively, more democratic working environment. As a result, women were not excluded from the participatory decision making process in developmental programs. Moreover, in Nepal, social hierarchies in the form of religion and caste are among the most significant factors affecting women's participation in CBFM (Shackleton et al, 2002). These social hierarchies do not exist in the South African context. As a result, the proportion of participating female-headed households in all the three studied communities was higher (52.1%) than that of participating male-headed households (47.9%).

Other studies have indicated the exclusion of women in the initial stages of CBFM as one of the main reasons for women's lower level of participation in CBFM. Unlike these studies, more women (68.7%) in the studied communities than men (31.3%), attended the initial meetings on CBFM planning as part of the ongoing day-to-day community developmental meetings. According to Maskey et al (2006), the gender disparity in decision-making power in most households also harms the participation of women. However, due to efforts of government and other women rights groups to eliminate discrimination against women in South Africa, the gender disparity in decision-making power could have been very low in most households. In addition, women in these communities were more likely to participate in CBFM than men because females usually see the forest as a means of meeting basic needs and as a support mechanism for increasing self-reliance, while men are more likely to view the forest as a source of income (Newmark et al, 1993). Since there was little income opportunities from the forests, men were thus, less interested to participate. Moreover, women were more likely to participate

than men because of the pre-existing gender division of labor wherein firewood collection and cooking is usually woman's work. In the studied communities of KwaZulu-Natal, women bear the main burden of gathering firewood stemming from this gender division of labor.

The sign of the estimated coefficients for household size (HHOLD_SIZE) in both the first and second contrast were negative and statistically significant implying that larger households were less likely to be in the non-participating categories (*i.e.*, 'willing to join and participate' or 'not willing to join and participate') than being in the 'already participating' category. Surprisingly, the positive sign of the statistically significant coefficient estimates for the number of adults (ABOVE_15) in the first and second contrast shows that a household with more members above 15 years old was statistically significantly more likely to be in the 'willing to join and participate' category than being in the 'already participating' category. The number of members above 15 years was a proxy for the household labor endowment. According to Ur-Rehman & Chisholm (2007), availability of household labor can affect households' capacity to allocate labor between CBFM and other activities such as crop production and may again influence the decision to participate in CBFM. The positive and statistically significant parameter estimate for number of adults (ABOVE_15) could mean that households with more members above 15 years were investing their time in better income opportunities elsewhere than participating in CBFM. On the other hand, the negative and statistically significant parameter estimate for household size (HHOLD_SIZE) supports the results by Agrawal & Angelsen (2010) who found that household size can influence preferences over different resources. For example, demand for fuel-wood can vary directly with household size and might influence preferences to manage forest resources (Agrawal & Angelsen, 2010).

In a study by Thoai & Ranola (2010), household labor endowment showed the greatest effect on decisions of farmers to participate in collective forest management. However, in this study, the odds ratio for the parameter estimate for the continuous variable household size (HHOLD_SIZE) did not have the largest effect on the odds of being either in the 'willing to participate' or 'not willing to participate' category relative to the 'already participating' category. The estimated odds ratio for household size (HHOLD_SIZE) was 0.44, suggesting that the odds of a household being in the 'not willing to participate' category rather than 'already participating' (*i.e.*, P_3/P_1) falls by 0.44 with each additional household member. In the studied communities, household labor endowment did not show the largest effect on household participation decisions possibly because the CBFM programs in the studied areas of KwaZulu-Natal were not that labor intensive. The main forestry activities were coppicing, attending meetings and forest protection/guarding. Reforestation and harvesting for income purposes (which require more labor) had not been initiated.

The total amount of social grants (child grants, pensions and disability grants) received by the household also influenced the participation status of households. The estimated coefficients for total amount of social grants (TOT_SOC_GRANT) in both the first and second contrasts were positive and statistically significant. This indicates that a household was more likely to be non-participating (*i.e.*, 'willing to join and participate' or 'not willing to join and participate') than being 'already participating' as the value of social grants received by the household annually, increases.

Conventional economic theory suggests that social grants may undermine labor force participation by reducing the opportunity cost of not working (Samson et al, 2004). Degeti

(2003) also argued that the easy availability of grants and subsidies is one of the socio-economic factors negatively affecting people's participation in natural resource management. On the other hand, Keswell (2004) argues that certain types of social transfer programmes, particularly public works schemes promote labour market, participation and employment. Evidence by Keswell (2004) in South Africa, suggests that receipt of social grants is associated with increased labor-force participation, possibly because cash makes job seeking easier. However, the results of this study indicate that the effect of social grants on participation in community programmes is different. They suggest that households receiving more income in the form of social grants were more likely not to participate in CBFM. Therefore, social grants could have acted as a disincentive for households to participate in CBFM.

Higher levels of income above the mean household total income (INCOM_AB_MEAN) also positively influenced household participation in CBFM. The positive and statistically significant coefficient for income above average (INCOM_AB_MEAN) shows that the sampled households that had incomes above the average were statistically more likely to be in the 'willing to join and participate' category than 'already participating'. This implies that more households receiving below average income had joined the CBFM than households receiving above average income levels at the time of the survey. The results of this study disagree with Salam et al (2006) who found that households with higher income levels are more likely to engage in environmental development programs. They also differ from the findings of Agrawal & Gupta (2005) and Behera & Engel (2004) who found that the likelihood of participation in community level user groups is greater for those who are economically and socially better-off. They attributed the lack of participation by poor households to the high opportunity cost of participation, as the time spent on participation could be used as labour for cash income (Behera, 2004). Although most

studies on community forest management have recognised high levels of participation in environmental conservation activities among high income households, the situation in the study areas of KwaZulu-Natal, South Africa, was different. Most of the household heads (71.3%) for high income households (*i.e.*, households receiving incomes above average) had not matriculated. Moreover, the average level of environmental awareness (3 on a 6 point scale) for the study communities was generally low. Thus, compared to high income household heads in more affluent communities studied by Robson et al (1996) in Canada, the heads of high income households in this study had low levels of education and awareness on the harmful effects environmental degradation to recognise the importance of managing forests. Since households attached anthropocentric values to forests, high incomes, could also have meant high opportunity cost for households to invest time in managing forest resources which had limited income opportunities.

Bright & Stinchfield (2005) argued that occupation and income are closely linked together and are related to values, attitudes toward nature and increase households' responsibility towards the environment. Similarly, household heads that were employed (EMPLOYNT_STAT = 1) in these rural communities were statistically significantly less likely to be in the 'willing to join and participate' category rather than the 'already participating' category. This can be explained by the fact that employment is linked to increased general knowledge and awareness due to the social networks (Harshaw & Tindall, 2005). In addition, some of the people who were employed and living in these rural areas held development-related posts and due to the nature of their work, they felt obliged to participate in development-related programs through attending meetings. Examples include councillors and members of rural development committees. According to Harshaw & Tindall (2005), social networks influence one's value orientations and responsibility

towards forests. In that respect, it can be concluded that those community members who were employed were more enlightened and, thus, were less likely to be in the non-participating categories.

According to Ostrom et al (1993) collective action is successful if users see high economic potential from the current activities. However, this was not the case in the study communities. Households that were selling some products from the forests were more likely to be in the category 'willing to participate' than already participating. This implies that households that were selling forest products were less likely to participate in CBFM programs. This anomaly could be explained by the fact that there were very low income opportunities from forestry in the study communities. Only a few households (7.1%) were selling forest products. Moreover, although these households were selling some forest products, the proportion of income obtained from such activities was very low to give households an incentive to manage forests. Considering that rural households in these communities, most importantly, attach anthropocentric values to forests, the lack of income opportunities from CBFM could actually have been the main reason for the lack of participation among the majority of community members. However, from this study, it can also be noted that people can actually participate just for social or livelihood benefits. In all the three communities, forests were being managed for social and livelihood benefits and very little income benefits. The forests in KwaSobabili and New Reserve B were mainly providing burial logs and building timber for households that were poor or that had been affected by natural disasters (e.g. storms). Similarly, in a study on factors influencing people's participation in forest management in the Indian states of Bihar, Hariyana and Uttar, Lise (2000) found that the first consideration for user's participation in forest

management are social motives, whereas economic motives were found to be the second most important consideration (Behera, 2004).

The odds of a household being in the 'not willing to participate' category rather than being in the 'already participating' category were also influenced by the distance of the household from the forest (DIST_TO_FOREST). The coefficient estimate for (DIST_TO_FOREST) in the second contrast was negative and statistically significant. This shows that a household was less likely to be in the 'not willing to join and participate' category than being in the 'already participating' category if it was further away from the forest. This means that households further away from the forests were more likely to participate than those who were close to the forest. The estimated odds ratio for this continuous variable (DIST_TO_FOREST) in the first contrast is 0.90 suggesting that the odds of a household head being unwilling to participate in CBFM rather than being already participating (*i.e.*, P_3/P_1) decreases by 0.9 when the time taken to get to the forest increases by a minute. Chhetri et al (1998) have shown that proximity to a forest is an important factor affecting the level of participation in CBFM. They argue that if the household lives a full day's walk from the forest, the cost of participation is immense just in terms of travel time. However, in the studied communities, households that were further away from the forests were more likely to be participating because they tend to face higher resource scarcity than those close to the forests (Conroy et al, 2002). In a scarcity situation, the differences between forest user-groups tend to get minimized in the face of the common problem and it becomes easier to develop a consensus for initiating forest protection (Conroy et al, 2002). The resources are also scarce to those who live far away from them. Therefore, they were more willing to participate to guarantee themselves access to the forest resources. Chances of households further away to free-ride without being caught are also low compared to those close to the forest. Therefore, it is

possible that households residing nearer to forest resources were not satisfied with the organised forest management as the rules of the CBFM would make room for equal access to forest resources with those further away from the forest. It is also possible that those further away were looking for recognition and to make their impact felt in order to get ownership share of the forest resources.

A study by Conroy et al (2002) found that communities were only initiating forestry protection programmes after neighbouring forests had become degraded causing villagers to experience scarcity of certain forest products, which they had taken for granted earlier. The results of this study agree with these findings. The estimated coefficient for perception of degradation (PERCEPTION_OF_DEGRAD) was negative and statistically significant in the second contrast. Thus, households that perceived forests as being degraded were statistically less likely to be in the category 'not willing to join and participate' than being in the 'already participating' category. The findings agree with Dolisca et al (2006) and Conroy et al (2002) who argued that perception of forest resource degradation is crucial for households to engage themselves in CBFM. However, the biggest challenge is that degradation and scarcity are relative concepts perceived differently at different places. The perception is influenced by, among other things, the rate of degradation, nature of degradation and availability of substitutes for forest products (Dolisca et al, 2006).

In this study, households that had alternative sources of forest products were less likely to be unwilling to participate than being 'already participating'. The coefficient estimate for household use of alternative forests (ALTRNTIVE_SRCS) was negative and statistically significant in the second contrast. As noted previously, households that were using alternative forests to get forest

products were doing so because they were more dependent on forests. The household use of alternative forests was a proxy for the dependency on forests. Thus, households that were more dependent on forests (required more forest products) were more likely to be already participating. This is in accordance with the results of the study by Thoai & Ranola (2010) who also found that households that were more dependent on the forest products for their livelihood displayed similar behavior.

Based on the results by Thoai & Ranola (2010), households that are more dependent on forest resources are more likely to paprticipate in managing the forests. However, in this study, households that were receiving more head loads (NO_OF_HDLOAD) of firewood and those who were selling forestry products (SELL_FRST_PRD) were more likely to be in the non-participating categories (i.e., willing to join and participate' and not willing to participate). According to Thoai & Ranola (2010) households that were getting more firewood (i.e., more dependent on the forest products for their livelihood) were expected to be participating than those that were not. Likewise, higher income derived from forests helps farmers to recognize the benefit from protecting forests, therefore, creating the incentive to participate in forest management programs (Thoai & Ranola, 2010). Considering the fact that those who were closer to the forests, those who were selling forest products and those who were getting more head loads of firewood were more likely not to participate, it is possible that some households were resenting the organised forest management thinking that it would restrict them from exploiting forest resources. The other possibility causing such results could be the fact that most households in the studied communities could free-ride on other forests which were not monitored under CBFM programs. Although households were using more firewood, they did not have the

incentive to participate in CBFM because they had alternative sources, where they could free-ride.

4.5.4 Factors constraining interested and willing households from participating

One category that was found to be interesting for policy regarding CBFM in the studied areas was the 'willing to participate' category. This is because households in this category had the potential to participate provided the constraints were addressed. As a result, further investigations were conducted to find out why they were not participating despite their willingness to participate. One reason could be that households might be reluctant to join CBFM even though they are interested to participate as a result of the force of habit. However, in this study, it was hypothesised that some households were interested to participate but not yet participating because of dissatisfaction emanating from several factors affecting the smooth-running of CBFM programs. It was also hypothesised that most of the issues causing household dissatisfaction were short-run factors, which if altered, could have made these households participate. Examples of such short-run factors include dissatisfaction with the CBFM committee, perception of being discriminated, lack of trust on the continuity of benefits and benefit distribution, presence of CBFM conflicts, perception about forest resources conservation responsibility as well as household misunderstanding of CBFM plan. The chi-squared test was employed to check if there was a relationship between these possible causes of household head's dissatisfaction in CBFM and household participation status. A description of the explanatory variables tested using the chi-squared test are presented in chapter 3 (*see Table 3.5*).

Table 4.12: The chi-squared test explaining short-run differences between already participating households and those interested to participate

Household characteristics	Household participation status		Chi-square test sig. levels
	Participating	Willing to participate	
SATISIFAXN_WIT_COMITEE			0.065**
satisfied	80.0%	74.1%	
not satisfied	20.0%	25.9%	
DISCRIMINATION			0.009***
No discrimination	75.0%	83.3%	
discrimination present	25.0%	16.7%	
CBFM_CONFLICTS			0.043**
Present	62.5%	64.8%	
Not present	37.5%	32.2%	
TRUST_ON_BENEFITS			0.003***
No trust	15.0%	27.8%	
Trust	85.0%	72.2%	
CONSVTN_RESPONSBLTY			$0.32^{N.S.}$
External	25.0%	37.0%	
Community	75.0%	63.0%	
HARVEST_PROHIB			$0.135^{N.S.}$
Dissatisfied	35.0%	33.3%	
Satisfied	65.0%	66.7%	
UNDRSTND_CBFM _PLAN			$0.462^{N.S.}$
Understand	27.5%	27.8%	
Not understand	72.5%	72.2%	

Source: Survey data (2011)

Notes: *, **, *** means statistically significant at the 10%, 5% and 1% levels, respectively
N.S. means not significant

Table 4.12 shows the results of the chi-squared test. The statistically significant chi-square value for household heads' satisfaction with committee, perception of discrimination, dissatisfaction with CBFM conflicts shows that each of these variables significantly influenced the household participation status. A larger proportion of participating households (80.0%) were satisfied with

the CBFM committees compared to those that were willing to join and participate. Compared to those who were willing to participate, a larger proportion of already participating households (25.0%) perceived discrimination in the CBFM. The proportion of household heads who had the perception of being discriminated was low (16.7%) among those who were willing to join and participate than those who were already participating (25.0%) probably because they had not started participating to experience such forms of discrimination. Trust on benefit distribution is also very crucial for successful CBFM. A larger proportion of participating households had trust that the benefits from CBFM can be distrusted among the users compared to those who were willing to join and participate. CBFM conflicts can also prevent interested households from participating in CBFM programs. A larger proportion of households that were interested to join and participate (64.8%) acknowledged the presence of CBFM conflicts compared to (62.5%) among the already participating households.

Thus, the main differences between already participating households and those who were willing to participate could have been mainly on satisfaction with CBFM committee, perception of discrimination, their perception about the CBFM conflicts and differences in the level of trust on benefit distribution. Such constraints need to be addressed to allow interested households to participate and allow the smooth-running of the CBFM programs. The other reason that could have made more households indicate that they were interested to participate (but not yet participating) could be the external support that was being provided by Farmers Support Group under the SCI-SLM project. Although the CBFM programs in the study communities had been established years ago, they only gained impetus after 2010, through the SCI-SLM project that was providing external support in terms of education, awareness and engaging other stakeholders with the vision of turning some of the community-managed plantations into viable and

sustainable income generating projects. Thus, by the time of the survey, most households had been mobilised and made aware such that they were interested to participate. Other households were now interested to participate hoping that external support through the SCI-SLM project and other stakeholders would make these communities establish income generating projects. Therefore, external support is crucial for the sustainability of CBFM programs.

4.6 Summary

This chapter empirically investigated the values households in KwaSobabili, New Reserve B and Gudwini rural communities of KwaZulu-Natal attach to forest products and services. Principal component analysis was used to generate composite indices representing quantitatively, the values households in these rural communities attach to forest resources. Ordinary least squares and generalised least squares regression were used to determine the socio-economic and institutional factors influencing such household value orientations. The chapter also investigated whether the values households attach to forest resources, socio-economic and institutional factors influence household's decision to participate in CBFM. The multinomial logit model was used to predict household's participation status (*i.e.*, participating, willing to join and participate and not willing to join and participate) as a function of the values households attach to forest resources as well as other socio-economic and institutional explanatory variables.

CHAPRTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study was motivated by the difficulties that have continued to be encountered in sustaining CBFM programs in many rural communities of South Africa. The main problem underlying the lack of sustainability of CBFM programs is the limited participation of households in such initiatives. The low levels of household participation in CBFM programs have been attributed to the fact that the values households in most South African rural areas attach to forests are poorly understood for appropriate policy recommendations regarding CBFM programs. Thus, this case study sought to improve this understanding by examining the values households in KwaSobabili, New Reserve B and Godwini communities of KwaZulu-Natal attach to forest resources and the factors influencing their participation in CBFM programs.

Although many recent studies in more affluent societies of the United States and Canada have noted a shift towards bio-centric value orientation, this study concluded that in less affluent rural communities such as the ones studied in South Africa, predominantly attach anthropocentric values to forest products and services. In less affluent societies, life is mainly about survival and, hence, households attach values to forests from a human-centred and commodity point of view (*i.e.*, anthropocentric value orientation). As a result, socio-economic factors that reflect the utility derived from forests, including the distance to the forest, household income levels, household dependency on forests and environmental awareness, are the main determinants of the anthropocentric values households attach to forest resources. Since rural households in less affluent societies have a utilitarian orientation to forest resources, it is expected that CBFM programs that enhance human livelihood options and alleviate poverty are more likely to foster

user's participation in poorer societies. Pure conservation without addressing the livelihoods of local communities is neither practical nor sustainable. Forest management practices in less affluent societies should, therefore, gravitate towards income generating CBFM programs, which allow the sustainable utilization and conservation of forest resources, simultaneously addressing deforestation and poverty alleviation.

While less affluent South African rural households predominantly regard forest products and services with a utilitarian (anthropocentric) view, they also attach cultural/moral/spiritual and non-use values. Therefore, forests should not only be viewed as economic entities and their management should emphasize the 'full' value communities attach to them, rather than only considering market values and benefits. The values that households attach to forests also vary with characteristics of the heads of households (*i.e.*, age, gender, marital status, and level of education) and those of the households (*i.e.*, income levels). Thus, traditional forest management paradigm which endorses a forest resource utilization philosophy, based on the dominance of market over non-market values, may not result in the best outcomes since it fails to consider the cultural/moral/spiritual values households attach to forests. This might result in inappropriate policy recommendations regarding CBFM.

The social choice approach to measure forest values used in this study, measures the broad values of forest resources and can identify shifts in forest values over time. This approach also accounts for the non-market values of all the goods and services provided by forest resources, which is usually difficult to achieve. Since the social choice approach incorporates both the market and non-market forest values from a societal point of view (*i.e.*, society's value

orientations), it is a more suitable method for valuing forest resources before initiating CBFM programs.

Among other factors, the values that households attach to forest resources (forest value orientations) influence their decision to participate in CBFM. Households that attach more values on the products and services provided by forests are more motivated to invest their time in forest conservation activities. Thus, the values that households attach to forests reveal the degree of commitment they may have in conserving forests through local participation. Households can participate for anthropocentric, cultural/moral/spiritual and livelihood reasons and not just financial gains. In reality, anthropocentric, cultural/moral/spiritual and option/non-use values individuals attach to forests are intimately interrelated. Therefore, people's decisions to participate in CBFM are dictated by their affinity to diverse values, rather than through separate assessments of the costs and benefits of each part. By understanding the forest values that people hold, policy makers will be better equipped to design policies that reduce conflicts among stakeholders, and assist communities to implement forest plans.

Household decision to participate also depends on many socio-economic factors and the institutional setting in the management of local forests. In South Africa, women are more likely to participate than men because the gender disparity in decision-making power within communities that undermines the participation of women is minimal. Instead, the democratic working environment found in most South African rural areas has the potential to make women the drivers of CBFM programs. In addition to women, older household heads, larger households, those who perceive that there is degradation in the area and those who attach high anthropocentric and cultural/moral/spiritual values to forest resources are more likely to

participate in CBFM. On the other hand, younger household heads, men, married people, those with high levels of household income or social grants are less likely to participate in CBFM. Although households might have an interest to participate, they may in fact fail to do so if they are dissatisfied with the way previous CBFM initiatives have been managed *i.e.*, CBFM conflicts, perception of discrimination, running of the committees and if they do not have confidence in the continuity of benefits and benefit distribution.

5.2 Policy recommendations

Community-based management of public forests must be consistent with the ways in which communities value public forests. Drawing from the empirical results, this study recommends that:

- Policy makers should consider the values households attach to forest resources not just financial benefits when recommending policies to foster participation in CBFM. A broader concept of value that captures both market and non-market or monetary and non-monetary values should be considered. Broadening the definition of values ensures a wider range of community members who can participate,
- In rural areas of KwaZulu-Natal, CBFM should focus on meeting the anthropocentric needs of the local communities. Since most of these households are poor, community forestry programs should be designed to make a significant contribution to the alleviation of poverty among rural South Africans. The challenge is to synchronise rural poverty reduction with forest use while preventing forest degradation,
- CBFM in rural South Africa should target women to be the drivers of such programs since they are more likely to participate in CBFM than men,

- In addition to women, CBFM in South Africa should also target larger households, households with a higher dependence on forests, those that perceive that there is forest resource degradation as well as households that attach high anthropocentric and cultural/moral/spiritual values to forests to ensure participation in CBFM programs,
- There is a need, however, for policy makers to continue to monitor how the changing socio-economic factors, institutional settings and the values communities attach to forest resources influence household willingness to participate in CBFM programs.
- Development activities of Government extension services and Non-Governmental Organisations need to embrace CBFM and provide support to improve environmental awareness. This can improve the perception of rural communities towards forest degradation and broaden the participation base and ensure the sustainability of CBFM programs.
- Government extension services and Non-Governmental Organisations should also provide external support aimed at reducing CBFM conflicts, dissatisfaction by the forest management committees, and their perception of discrimination. Such efforts can ensure households are satisfied with both, the way resources are managed and how benefits are distributed.

5.3 Recommendations for further studies

- The levels of participation in CBFM were not considered in this study. There is, therefore, a need for further investigation on the factors influencing the different levels of household participation,
- The influence of social capital on household decision to participate has not been examined in this study. It would provide further insights if an investigation is conducted

on how factors such as trust among group members affect household decision to participate in CBFM,

- Three participation categories were considered in the MNL model to estimate the factors influencing household decision to participate in CBFM. Future studies can bring more insights by analyzing the reasons and the characteristics of households that had stopped participating in CBFM,
- It is also crucial to investigate the characteristics of households that would be interested to participate in food-for-work or cash-for-work as alternative ways of managing the forests,
- Unlike the social choice approach used in this study, the values households attach to forests could also be measured using the willingness to pay or contingent valuation method. A comparison of the results with this study can provide insights on the strengths and weaknesses of the two methods of measuring forest values,

REFERENCES

Agarwal B (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World development* 29 (10): 1623-1648.

Agrawal, A and Angelsen A (2010). *Using community forest management to achieve*. REDD+ goals in Realizing REDD: National... sitemaker.umich.edu/ifri/ files/ifri_may _2010_ news letter. pdf. (Accessed 22 June 2011).

Agrawal A & Gupta K (2005). Decentralisation and participation: the governance of common pool resources in Nepal Terai. *World development* 33(7): 1101-1114.

Antle JM & Heidebrink G (1995). Environment and development: Theory and international evidence. *Economic development and cultural change* 43 (3): 603-625.

Averill J, Stanat P & More T (1998). Aesthetics and the environment. *Review of general psychology* 2(2): 153-174.

Barnham BL, Coomes OT & Takasaki Y (1999). Rain forest livelihoods: income generation, household wealth and forest use. *Unasylva* 50: 34-42.

Behera B (2004). *Who forms local institutions? Levels of household participation in India's Joint Forest Management program*. Centre for Development Research, University of Bonn, Germany.

Behera B & Engel S (2004). The four levels of institutional analysis of evolution of Joint Forest Management (JFM) in India: *A new institutional economics (NIE) approach, paper presented at the Annual Meetings of the International Association for the Study of Common Property* (IASCP), Oaxaca, Mexico.

Bengston DN, Webb TJ & Fan DP (2004). Shifting forest value orientations in the United States, 1980–2001: A computer content analysis. In *Environmental Values* 13(3): 373–92.

Bengston DN, Fan DP & Celarier DN (1999). A new approach to monitoring the social environment for natural resource management and policy: The case of US national forest benefits and values. *Journal of environmental management* 56: 181-193.

Bengston, D, & Xu, Z. (1995). Changing national forest values: A content analysis St. Paul, Minn.: North Central Forest Experiment Station, Forest Service, U.S. Dept. of Agriculture. USA.

Bengston DN (1994). Changing forest values and ecosystem management. *Society and natural resources* 7: 515-533.

Berninger K & Kneeshaw D (2009). Forest value orientations and attitudes towards forestry of interest groups in three regions varying in importance of commercial forestry. International Journal of Sustainable Society 1(4): 391-408.

Bishop JT (1999). *Valuing Forests: A Review of Methods and Applications in Developing Countries*. International Institute for Environment and Development: London.

Borrie WT, Freimund WA & Davenport MA (2002). Winter visitors to Yellowstone National Park: Their value orientations and support for management actions. *Human ecology review* 9(2): 41-48.

Bright A & Stinchfield H (2005). An assessment of public knowledge, values, and attitudes toward biodiversity and sustainable forestry. *Final Report to the National Commission on Science for Sustainable Forestry*. NCSSF Research Project C5. Colorado State. USA.

Bright AD & Stinchfield H (2009). *Assessment of Public Knowledge, Values and Attitudes toward Biodiversity and Sustainable Forestry*. Department of Natural Resources Recreation and Tourism Colorado State University. USA.

Bruce JW (1999). Legal bases for the management of forest resources as common property. *Community forestry note*. Food and Agriculture Organization (FAO) of the United Nations. Rome Italy. On http://www.fao.org/docrep/012/x2581e/x2581e00.pdf. (Accessed on 03 March 2011).

Carter-Hill R, Griffits WE, Lim GC (2008). *Principals of econometrics*. 3rd Edition. John Wiley & Sons, Inc USA.

Cavuta, G (2006). *Environmental goods valuation: the total economic value*. University of Chieti - Pescara, "G. D'Annunzio", Italy On http://www.openstarts.units .it/dspace/ bitstream /10077/860/1/e7cavuta.pdf (Accessed on 02 January 2012).

Chen TB & Chai LT (2010). Attitude towards the environment and green products: Consumers' perspective. *Management science and engineering* 4(2): 27-39.

Chhatre A & Agrawal A (2008). Forest commons and local enforcement. *Proceedings of the National Academy of Sciences* 105(36): 13286-13291.

Chhetri BBK (2005). Community Forestry Program in the Hills of Nepal: Determinants of User Participation and Household Dependency. *A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science in Management of natural resources and sustainable agriculture*. Department of International Environment and Development Studies (Noragric) Norwegian University of Life Sciences (UMB). Norway.

Chhetri RB, Tiwari S & Sigdel H (1998). Situation Analysis Study: Commonalities and Variations of Situations in Selected Districts of Nepal. *Working Paper*. Kathmandu: EFEA Programme.

Cocks ML, Bangay L, Wiersum KF & Dold AP (2006). Seeing the wood for the trees: the role of woody resources for the construction of gender specific household cultural artefacts in

non-traditional communities in the Eastern Cape, South Africa. Environmental Development Sustainability 8:519–533.

Cocks M, Dold T & Wiersum F (2003). The cost of culture. The role of natural resources in maintaining Xhosa customs. Veld and flora 146-149.

Coleman EA (2009). Institutional factors affecting biophysical outcomes in forest management. *Journal of policy analysis and management* 28(1): 122–146.

Conroy C, Mishra A & Rai A (2002). Learning from self-initiated community forest management in Orissa. India. *Forest policy and economics* 4(3): 227-237.

Coomes OT, Grimard F & Burt GJ (2000). Tropical forests and shifting cultivation: secondary forest fallow dynamics among traditional farmers of the Peruvian Amazon. *Ecological economics* 32(1):109-124.

Coulibaly-Lingani P, Patrice Savadogo P, Tigabu M, Oden PC. (2011). Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Forest policy and economics* 13:292–302.

Coulibaly-Lingani P, Tigabu M, Savadogo P, Oden PC, Ouadba, JM (2009). Determinants of access to forest products in southern Burkina Faso. *Forest policy and economics* 11:516-524.

Chyong HT, Phang G, Husan H, & Bucha MR (2006). Going green: A study of consumers' willingness to pay for green products in Kota Kinabalu. *International journal of business and society* 7(2): 40-54.

Dahal GR & Adhikari KP (2008). *Bridging, linking, and bonding social capital in collective action.* The Case of Kalahan Forest Reserve in the Philippines. Collective Action and Property Rights (CAPRi), 2033 K Street NW, Washington, DC 20006-1002 USA. www.capri.cgiar.org. (Accessed on 23 October 2011).

Degeti T (2003). Factors Affecting People's Participation in Participatory Forest Management: The case of IFMP Adaba-Dodola in Bale zone of Oromia Region. *A Thesis submitted to the school of graduate studies of Addis Ababa University in partial fulfillment of the requirements for the degree of Master of Arts in Regional and Local Development Studies (RLDS).* Addis Ababa University. School of Graduate studies Regional and Local Development Studies (RLDS). Ethiopia.

Delali BK, Dovie DBK, Shackleton CM, Witkowski ETF (2007) .Conceptualizing the human use of wild edible herbs for conservation in South African communal areas. Journal of Environmental Management 84: 146–156.

Department of Water Affairs and Forestry (DWAF) (2005). *Forestry and Poverty Key Issues Paper – 7th draft June 2005*. South African Department of Water Affairs and Forestry.

Department of Water Affairs and Forestry (DWAF) (1997). Sustainable Forest Development in South Africa- the policy of the Government of National Unity. Pretoria, South Africa.

Department of Water Affairs and Forestry (DWAF) (1995). Existing situation of forest and wildlife resources in the Limpopo province. http://www.lda.gov.za/downloads/downloads reports/Forestry%20and%20Wild%20life.pdf. (Accessed on 22 December 2011).

Dhakal B & Bhatta B (2009). An institutional model to explain utilization problem of community forest products. *International journal of social forestry* 2(2):123-148.

Dolisca F, Carter DR, McDaniel JM, Shannon DA, Jolly CM (2006). Factors influencing farmers' participation in forestry management programs: A case study from Haiti. *Forest ecology and management* 236 (2): 324-331.

Dovie DBK (2003): Rural economy and livelihoods from the non-timber forest products trade. Compromising sustainability in southern Africa? International Journal of Sustainable Development & World Ecology 10 (3): 247-262.

Dovie DBK, Shackbton CM & Witkowski TF (2002). Direct-use values of woodland resources consumed and traded in a South African village. International Journal of Sustainable Development and World Ecology 9: 269-283.

D'Silva E & Pai S (2003). Social Capital and Collective Action: Development outcomes in forest protection and watershed development. *Economic and political weekly* 38 (14):1404-1415.

Dube C (2010). Assessing cross-sectoral linkages in forestry: Status and current effort. Linking NFPS to National Development and International Processes. ETFRN NEWS 41/42: National Forest Programmes. European Tropical Forest Research Network. http://www.etfrn.org/etfrn /newsletter/news4142/nl41_oip_2_1.htm**.** (Accessed on 02 March 2011).

Field A (2009). *Discovering statistics using SPSS*. 3rd edition. SAGE publications. Oliver's Yard. London EC 1Y ISP. Google books.

Freeman MA (2003). *The measurement of environmental and resource values: Theory and methods*. 2nd edition. Resources for the Future. Washington DC, USA.

Gamborg C & Rune F (2004): Economic and ecological approaches to assessing forest value in managed forests: *Ethical perspectives, society & natural resources* 17(9):799-815.

Garson, GD (2009). *Logistic regression*. Statnotes from North Carolina State University. Http://faculty.chass.ncsu.edu/garson/PA765/logistic.htm. (Accessed on 23 December 2011).

Geldenhuys, CJ (1999). Southern African forests: their biogeography, conservation and utilisation. *In proceedings of the MAB/UNESCO regional Seminar on forests of the humid tropics of South and South East Asia,* Kany, Sri Lanka.

Ghai D & Vivian JM (1992). *Grassroot Environmental action: People participation in sustainable development*. Routledge, London.

Gibson RB (2001). *Specification of sustainability-based environmental assessment decision criteria and implications for determining 'significance' in environmental assessment'*, Canadian Environmental Assessment Agency Research and Development Programme, Ottawa. USA.

Gibson CC & Koontz T (1998). When "community" is not enough: Institutions and values in community-based forest management in Southern Indiana. *Human ecology* 26 (4): 621-647.

Godoy R, Jacobson M, de Castro J, Aliaga V, Romero J & Davis A (1998). The role of tenure security and private time preference in neo-tropical deforestation. *Land economics* 74(2): 162-170.

Godoy R, Lubowski R & Markandya A (1993). A method for the economic valuation of non-timber tropical forest products. *Economic botany* 47(3): 220-233.

Gregory R (1999). Identifying environmental values. In V. H. Dale & M. R. English (Eds.), *Tools to aid environmental decision making* (pp. 32-58). New York:

Gregory R, Lichtenstein S, & Slovic P (1993). Valuing environmental resources: A constructive approach. *Journal of risk and uncertainty* 7 (2):177–197.

Greene W (2003): Econometric Analysis. Third edition, Prentice Hall, Englewood Cliffs.

Gujarati DN & Porter CD (2009). *Basic Econometrics* (5th Edition). McGraw-Hill, New York.

Hao J (2011). Residents' knowledge, perceptions, attitudes, and willingness to pay for nonpoint-source pollution control: A study of Nansihu Lake watershed, China. *Ph.D. dissertation*, The Ohio State University, United States Ohio. Retrieved May 1, 2011, from Dissertations & Theses: A&I.(Publication No. AAT 3292720).

Harshaw H. W. & Tindall D. B (2005). Social structure, identities, and values: A network approach to understanding people's relationships to forests. *Journal of leisure research 37(4):426-449.*

Hoffman TM & Todd S (2000). A national review of land degradation in South Africa: The influence of biophysical and socio-economic factors. *Journal of Southern African studies* 26(4):743-758.

Infiel M & Mugisha A (2010). Integrating cultural, spiritual and ethical dimensions into conservation practice in a rapidly changing world. *Prepared for the John D. and Catherine T. MacArthur Foundation.* Fauna & Flora International. http://www.macfound.org/atf/cf/%7 Bb. 0386ce3-8b29-4162. (Accessed on 08 June 2011).

Kalpana G (2009). Women as forest managers: the effect of men's outmigration. *PhD Thesis.* University of Natural Resources and Applied Life Sciences, Vienna (Austria).

Kant S & Lee S (2004). A social choice approach to sustainable forest management: an analysis of multiple forest values in Northwestern Ontario. *Forest policy and economics* 6: 215-227.

Karppinen H (1998). Values and objectives of non-industrial private forest owners in Finland. *Silva fennica* 32(1): 43–59.

Kerapeletswe CK & Lovett JC (2002). The Likely Effects of Inequality and Globalization on Sustainable Management of Common Pool Resources: The Case of Basarwa (Bushmen) of Botswana. *Paper presented at Ninth biennial conference of the inter-nation association of study of common property (IASCP)* June 17, Victoria Falls, Zimbawe.

Keswell M (2004). Social networks, extended families, and consumption smoothing: field evidence from South Africa. *Centre for Social Science Research Working Paper No. 58,* University of Cape Town. South Africa.

Kim JO & Mueller CW (1994). *Factor Analysis and Related Techniques*. Sage Publications, London. pg 111.

King DM & Mazzotta MJ (2000). *Ecosystem valuation.* Us Department of Agriculture Natural Resources Conservation Services and National Oceanographic and Atmospheric Administration. http://www.ecosystemvaluation.org/default.htm.(Accessed on 17 January 2011).

Kiyingi I & Bukenya M (2010). Community and ecotourist perceptions of forest conservation benefits: a case study of Mabira Central Forest Reserve, Uganda. Southern Forests: *Journal of forest science* 72 (4): 201-206.

Kuentzel WF & Dennis DF (1998). Landowner values, water quality, and recreation in the Lake Champlain Basin. In H. G. Vogelsong (ed.). *Proceedings of the 1997 Northeastern Recreation Research Symposium*. Gen. Tech. Report NE-241 (pp. 155-162). Radnor, PA: USDA Forest Service Northeast Forest Experiment Station.

Kumar S & Kant S (2007). Exploded logit modeling of stakeholders' preferences for multiple forest values. *Forest policy and economics 9*(5): 516-526.

Lal D (1999). *Culture, democracy and development: the role of formal and informal institutions on development*. http://www.imf.org/ External/Pubs /FT/seminar/1999/reforms/lal.htm. (Accessed on 20 July 2006).

Li C, Wang CW, Liu ST, Weng LH (2010). Forest value orientations and importance of forest recreation services. *Journal of environmental management* 91: 2342-2348.

Lise W (2000). Factors influencing people's participation in forest management in India. *Ecological economics* 34: 379-392.

Luzar EJ & Cosse KJ (1998). Willingness to Pay or Intention to Pay: The attitude-behaviour relationship in Contingent Valuation. *Journal of socio-economics* 27 (3): 427- 444.

Ma Z, Butler BJ, Kittredge DB & Catanzaro P (2011). Factors associated with landowner involvement in forest conservation programs in the U.S.: Implications for policy design and outreach. *Land use policy* 29:53-61.

Madalla GS (1983). Limited dependent and quantitative variables in econometrics. Cambridge University Press, London.

Mahanty S & Guernier J (2008). A fair share: Sharing the benefits and costs of community based forest management. *A paper for IASC 2008 Theme on understanding the benefits of the commons.* Regional Community Training Centre.http://iasc2008.glos.ac.uk/conference %20papers/papers/M/ Mahanty_ 224801.pdf. (Accessed on 10 April 2011).

Manivong K & Sophathilath P (2007). Status of Community Based Forest Management in Lao PDR. *A Status Report for the submission to The Regional Community Forestry Training Center for Asia and the Pacific* (RECOFTC) Bangkok, Thailand.

Manning R, Valliere W & Minteer B (1999). Values, ethics, and attitudes toward national forest management: An empirical study. *Society & natural resources* 12:421–436.

Mansaray & Abijoye JO (1998). Environmental knowledge, attitudes and behaviour in Dutch secondary school. *Journal of environmental education* 30(2):14-11.

Maskey V, Gebremedhin TG & Dalton TJ (2006). Social and cultural determinants of collective management of community forest in Nepal. *Journal of forest economics* 11(4): 261-274.

Maskey V, Gebremedhin TG & Dalton TJ (2003). A Survey Analysis of Participation in a Community Forest Management in Nepal. *Selected paper for presentation at the Northeastern Agricultural Resource Economics Association*, Portsmouth, New Hampshire, June 8-10, 2003. http://rri.wvu.edu/pdffiles/ gebremedhin2003-8wp.pdf. (Accessed on 15 May 2011).

McConnell KE (1997). Income and the demand for environmental quality. *Environment and development economics* 2: 383-399.

McFarlane BL &. Boxall PC (2000): Factors influencing forest values and attitudes of two stakeholder groups: The case of the Foothills Model Forest, Alberta, Canada. *Society & natural resources* 13:7:649-661.

Mendoza GA & Prabhu R (2005). Combining participatory modeling and multi-criteria analysis for community-based forest management. Forest Ecology and Management 207: 145–156.

Moehrke C (2010). Beliefs and Attitudes influence willingness to pay recreation fees at an *Urban Forest*: Incorporating attitudes in contingent valuation methods. *A thesis submitted* to Oregon State University.

Mogaka H, Simons G, Turpie J, Emerton L & Karanja F (2001). *Economic aspects of community involvement in sustainable forest management in Eastern and Southern Africa*. Natural Resource International and The World Conservation Union. Nairobi, Kenya. http://www.cbd.int/doc/case-studies/inc/cs-inc-iucn-03-en.pdf. (Accessed 30 August 2011).

Murphree MW (1993). *Communities as resource management institutions*. International Institute for Environment and Development, London.

Mwangi E, Meinzen-Dick R, & Sun Y (2011). Gender and sustainable forest management in East Africa and Latin America. *Ecology and society* 16(1): 17-28.

Napier TL, Carter MV, Bryant EG (1986). Local perceptions of reservoir impacts: a test of vested interests. *American journal of community psychology* 14(1): 17-37.

Nasi R, Wunder S, & Campos A (2002). Forest ecosystem services: Can they pay our way out of deforestation? *A discussion paper prepared for the GEF for the Forestry Roundtable held in conjunction with the UNFF II*, New York. USA.

National Marine Sanctuaries (2011). Socio-economic monitoring program for the Florida Keys National Marine Sanctuary – Knowledge, attitudes and perceptions of management strategies and regulations. National Marine Sanctuaries, Florida USA. http://sanctuaries. noaa.gov/science/ socioeconomic / floridakeys/kap/ (Accessed on 14 June 2011).

Newmark WD, Leonard NL, Sariko HI & Gamassa DM (1993). Conservation attitudes of local people living adjacent to five protected areas in Tanzania. *Biological conservation* 63:177-85.

Nieuwoudt, WL (1977). A principal component analysis of inputs in a production function. *Journal of agricultural economics* 23 (3): 277-83.

Nordlund A & Westin K (2011). Forest values and forest management attitudes among private forest owners in Sweden. *Forests* 2: 30-50.

Ngcobo, N (2002). State of Forest and Tree Genetic Resources in South Africa. *Prepared for the SADC Regional Workshop on forest and tree genetic resources, 5-9 June 2000, Arusha, Tanzania*. Forest Genetic Resources Working Papers, Working Paper FGR/28E. Forest Resources Development Service, Forest Resources Division. FAO, Rome (*unpublished*).

O'Brien E (2003). *Social and cultural values of woodlands and trees in northwest and southeast England*. Unpublished report to the Forestry Commission. United Kingdom.

Obua J (2002). *Socio-economic issues of tropical secondary forest management in Anglophone Africa. Workshop on tropical secondary forest management in Africa*: Reality and perspectives In collaboration with ICRAF and CIFOR Nairobi, Kenya. http://www.fao.org/DOCREP/ 006/ J0628E/J0628E30.htm#TopOfPage. (Accessed on 06 June 2011).

Ostrom E, & Wertime MB (2000). International forestry resources and institutions research strategy. In Gibson, C. C., McKean, M. A., and Ostrom, E. (eds.), *People and Forests: Communities, Institutions, and Governance*, The MIT Press, Cambridge, MA.

Ostrom E, Schroeder L & Wynne S (1993). *Institutional Incentives and Sustainable Development, Infrastructure Policies in Perspective*. Theoretical Lenses on Public Policy, Westview Press, Boulder, CO.

Ostrom E (1990). *Governing the commons: The evolution of institutions for collective action*, Cambridge University Press, New York.

Owen RJ, Duinker PN & Beckley TM (2009). Capturing old-growth values for use in forest decision-making. *Environmental management* 43: 237–248.

PACE (2010). Forest resource management. *Action sheet 47*. http://www .recoftc.org/ site/uploads/content/pdf/Status_of_Community_Based_Forest_Management. (Accessed on 22 October 2011).

Pietarinen J (1987). Man and the forest: four basic attitudes. *Silva fennica* 21(4): 323-331.

Poffenberger M, McGean B, Ravindranath NH, Gadgil M (1992). *Diagnostic tools for supporting joint forest management systems.* Society for Promotion of Wastelands Development Shriram Bharatiya Kala Kendra Building 1, Copernicus Marg New Delhi 110001, India.

Popoola L & Ajewole O (2002). Willingness to pay for rehabilitation of Ibadan urban environment through reforestation projects. *International journal of sustainable development & world ecology* 9(3):256–268.

Poteete A, Janssen M, Ostrom E (2010). *Working together: collective action, the commons, and multiple methods in practice*. Princeton University Press, Princeton, NJ.

Poteete AR & Welch D (2004). Institutional Development in the face of complexity: developing rules for managing forest resources. *Human ecology* 32(3): 279-311.

Putnam, Robert (1993): Making democracy work: Civic traditions in modern Italy, Princeton University Press.

Roberts KWS (1980). Interpersonal comparability social choice theory. *The review of economic studies*, 47 (2): 421-439.

Robinson JG & Redford KH (1991). *Sustainable harvest of neo-tropical mammals*. In: Robinson JG, Redford KH (eds), Neotropical wildlife use and conservation. Chicago: Chicago University Press. pp 415–429.

Robson M, Robinson D & Hawley A (1996). *Identifying the community of interests related to the McGregor Model Forest: Who is it that cares about the McGregor Model Forest and What is it that they care about?* UNBC Prince George, BC. Canada.

Robson M, Hawley A & Robinson D (2000). Comparing the social values of forest-dependent, provincial and national publics for socially sustainable forest management. *The forestry chronicle* 76 (4):615- 622.

Rosenberg E (2012). Land Degradation. Enviropedia.http://www.enviropaedia.com /topic/ default.php? topic_id=147.

Salam MA, Noquchi T & Alim MA (2006). Factors affecting participating farmers' willingness-to-pay for the Tree Farming Fund: a study in a participatory forest in Bangladesh. *Environmental monitoring assessment* 118(3):165-78.

Sampford C (2002). Environmental governance for biodiversity. *Environmental science & policy* 5: 79–90.

Samson M, Lee U, Ndlebe A, Quene KM, van Niekerk I, Gandhi V, Harigaya T, Abrahams C (2004). The social and economic impact of south Africa's social security system. *Economic Policy Research Institute & Department of Social Development. EPRI RESEARCH PAPER #. Final Report*. Sanclare building, 3rd floor, 21 Dreyer street Claremont 7700 Cape town. http://www.sassa.gov.za/Portals/1/Documents/0ad214d4-0dff-4ea5-b7ad-c73eec1.pdf. (Accessed on 17 October 2011).

Shackleton CM (2009). Will the real custodian of natural resource management please stand up. South African Journal of Science 105: 91- 93.

Shackleton CM, Shackleton SE, Buiten E & Bird N (2007). The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. Forest Policy and Economics 9:558-577.

Shackleton C & Shackleton S (2003). Value of non-timber forest products and rural safety nets in South Africa Paper presented at The International Conference on Rural Livelihoods, Forests and Biodiversity 19-23 May 2003, Bonn, Germany.

Shackleton C & Shackleton S (2006). Household wealth status and natural resource use in the Kat River valley, South Africa. Ecological Economics 57 306– 317.

Shackleton CM, Shackleton SE, Ntshudu M & Ntzebeza JN (2002). The role and value of savanna non-timber forest products to rural households in the Kat River Valley, South Africa. *Journal of tropical forest products* 8: 45–65.

Shah P & Maitra V (2004). *Terrocatta reader: a market approach to the environment*. Centre for Civil Society. Google books. 2nd edition. New Delhi, India. Community+ management +of+ fores +resources&ots (Accessed on 23 September 2011).

Sharp FV (1979). Statistics for the Social Sciences. University of Michigan. Google books.USA.http://books.google.co.za/books/about/Statistics_for_the_social_sciences.html?id=QdHAAAAMAAJ&redir_esc=y. (Accessed on 04 March 2012).

Shin E, Hufschmidt M, Lee Y, Nickum JM, Umetsu C, Gregory R (1997). Valuating the economic impacts of urban environmental problems: Asian cities. *Working Paper No. 13*. UNDP/UNCHS/The World Bank-UMP. Washington, DC 20433, USA.

Shindler B & Cramer LA (1999). Shifting Public Values for Forest Management: Making Sense of Wicked Problems. *Journal of applied forestry* 14(1): 28-34.

Sneddon C, Howarth RB & Norgaard RB (2006). Sustainable development in a post-Brundtland world. Ecological economics 57 (2): 253–268.

Steel BS & Lovrich NP (1997). *An introduction to natural resource policy and the environment: Changing paradigms and values.* In Steel BS, ed. Public Lands Management in the West. Westport, Conn.: Greenwood Publishing, 104 -117.

Steel BS, List P, Shindlier B (1994). Conflicting values about federal forests: A comparison of national and Oregon publics. *Society & natural resources* 7(2):137-153.

Stimulating Community Initiatives in Sustainable Land Management' (SCI-SLM, 2010). SCI-SLM University of KwaZulu-Natal. http://scislm.ukzn.ac.za/Homepage.aspx. (Accessed on 21 March 2011).

Tarrant MA, Cordell HK, & Green GT (2003). The Public Values of Forests Scale. *Journal of forestry* 101(6): 24-30.

Tarrant, M.A. & Cordell, H.K. (2002). Amenity values of public and private forests: Examining the value-attitude relationship. *Environmental management* 30(5): 692-703.

Thoai TQ & Ranola RF(2010). Decision making by upland farmers on forest management in the Northwest mountainous region of Vietnam. *Journal of ISSAAS* 16(1): 68-82.

Tindall DB (2003). Social values and the contingent nature of public opinion, attitudes, and preferences about forests. *The forestry chronicle* 79(3): 692-705.

Trainor SF & Norgaard RB (1999). Recreation fees in the context of wilderness values. *Journal of park and recreation administration* 17: 100-115.

Twine W (2005). Socioeconomic transitions influence vegetation change in the communal rangelands of the South African lowveld. *African journal range forage science* 22:93–99.

Twine W, Moshe D, Netshiluvhi T & Siphugu V (2003). Consumption and direct-use values of savannah bio-resources used by rural households in Mametja, a semi-arid area of Limpopo province, South Africa. South African Journal of Science 99: 467- 473.

Uddin MA (2006). *Local perceptions of natural resource conservation in Chianti Wildlife Sanctury*. University of Chittagong, Bangladesh.

Ur-Rehman M & Chisholm N (2007). Factors affecting households' participation in the natural resource management. Activities in District Abbottabad, Pakistan: A Multivariate Analysis. *Journal of Asian and African Studies* 42: 495- 516.

Vaske JJ, Donnelly MP, Williams DR, Jonker S (2001). Demographic influences on environmental value orientations and normative beliefs about national forest management. *Society and natural resources* 14(9): 761-776.

Webb TJ, Bengston DN & Fan DP (2008). Forest Value Orientations in Australia: An Application of Computer Content Analysis. Environmental Management 41:52–63.

Wickramasinghe A, Perez MR & Blockhus JM (1996). Non-timber forest product gathering in Ritigala Forest (Sri Lanka): Household strategies and community differentiation. *Human ecology* 24(4): 493-519.

World Bank (1994). The world bank and participation. The World Bank operation policy department. Washington DC. The World Bank.

Zaccagnini EM, Cloquell S, Fernandez E, Gonzalez C, Lichtenstein G, Novaro A, Panigati JL, RabinovichJ & Tomasini D (2001). *Analytic framework for assessing factors that influence sustainability of uses of wild living natural resources*. IUCN World HQ Rue Mauverney 28 CH - 1196 Gland Switzerland.

APPENDICES

Appendix 1: The questionnaire used for data collection

I-**Farmer Support Group** phansi kohlelo lwe "Stimulating Initiatives in Sustainable Land Management" (SCI-SLM), kanye neNyuvesi yakwaZulu-Natali, kumnyango weZolimo kanye nomnotho benza ucwaningo lokubuka ukuthi: Amakhaya azithatha/aziphatha kanjani izizinda zamahlathi, nokubamba iqhaza komphakathi ekuphatheni/ekunakekelweni kahle amahlathi. Kulezizindawo ezilandelayo: **Bergvile Estcourt nase Msinga** esifundazweni sakwaZulu-Natali. Bacela ukuthi niphendule imibuzo elandelayo ngokusemandleni enu.

Sicela ukwazi ukuthi uzibandakanya ngokuvolontiya kulolucwaningo, ngokugcwalisa i-form. Futhi, nokukuqinisekisa ukuthi, imininingwane yakho izohlala iyimfihlo nezimpendulo zakho angeke zisetshenziswe kwenye indawo ngaphandle kwalolucwaningo olwenziwa ngumnomzane uStanley Sharaunga ngokwesigaba sezinga lemfundo akuso (Masters). Siyabongakakhulu ngokuzinikela kwakho nokusebenzisana nathi.

RESPONDENT IDENTIFICATION

Enumerators Name	
Respondent No.	
Date	
Area	
Village/Section	
District	
Type of Forest/*Uhlobo lwehlahthi*	

1. Section A. Household head's socio-economic factors/*Inhloko yekhaya ngokwe-nhlalo nezomnotho yomndedi* ***NB: Household head refers to the de facto household head and stays in that household for four or more days in a week .***

1.1 Age/ *iminyaka*	
1.2 Gender /*ubulili* 1 = male/*wesilisa* 2 = female/*wesifazane*	
1.3 H/hold size/ *inani lamalunga omndeni* (**only those who stay here for four or more days in a week**/ *labo abahlala ekhaya ezinsukwini ezine evikini)*	
1.4 No of children and grandchildren who are less than 15 years/ *inani lezingane kanye nabazulukulu abaneminyaka engaphansi kwa-15*	
1.5 **No of adult females who are above 15 years**/*inani labesifazane abaneminyaka engu -15 kuya phezulu*	
1.6 How many household members are still attending school?/*bangaki abasafunda isikole /ezikhungweni zemfundo ephakeme kulelikhaya?*	
1.7 Marital status/*isimo sezokuphilisana komndeni* 1 = married/*shadile* 2 = single/*angishadile* 3 = divorced/*wehlukanisile* 4 = widowed/*ungumfelwa/umfelokazi* 5= other (specify) *nokunye(cacisa)...*	
1.8 Employment status/isikhundla somsebenzi 1 = unemployed/*akngisebenzi* 2 = formal/permanent employment/*umsebenzi oqashwe ngokuphelele* 3 = informal/ non-permanent employment/*itoho*	
1.9 Highest level of formal education/izinga lokufunda 1 = Never been to school/*akaze afunde* 2 = Adult education/*imfundo yabadala* 3 = Primary/*amabanga aphansi* 4 = High school but did not complete/*matric/amabanga aphakeme kepha zange aphothule kumatikuletsheni* 5= Matriculated/*matikuletsheni* 6 = College/university/*kolishi/nyuvesi*	
1.10 **Does your household engage in any farming activities?**/*ingabe kukhona yini oyilunga lomndeni ozibandakaqnya kwezolimo?* (0 = No; 1 = Yes)	
1.11 If yes, what is the main product that your household produces?/*uma uthi yebo ,yiluphi uhlobo lwezitshalo abazikhiqizayo? (Specify/kubalule)….*	
1.12 If not in 1.10, what activity is your household mainly involved in for income? *Uma uthi cha, yini abayenza ebalethela inzuzo?* **……**	
1.13 How many members (*who lives here*) of your household are permanently employed?/ *bangaki abasebenzayo (abahlala lapha ekhaya)*	
1.14 Do you hold any political/government/traditional leadership post?/*ingabe uyazibandakanya ezikhundleni zepolitiki/kuhulumeni/ubukhosi?* (0 =No post/*lutho*; 1 = political post/*sopolitiki*; 2 = government post/*kwezikahulumeni*; 3 = traditional post/ *ebukhosini*)	

2. Section B: Forest values/*ukubaluleka kwehlathi*

How important are the following forest functions to you? Rate them according to the following (1= opposed to my values; 2 = unimportant; 3 = neutral; 4 = important; 5 = very important). *(NB: I don't know = unimportant)*

	Score
2.1 Burial logs/*izingodo zokungwcaba*	
2.2 Firewood/*inkuni*	
2.3 Construction poles/*izigxobo zokwakha*	
2.4 Electricity pole lines/*izigxobo zikagesi*	
2.5 Craftwork/*umsebenziwezandla*	
2.6 Traditional medicine/*umuthi wesintu*	
2.7 Mushroom/*amakhowe*	
2.8 Edible fruits/*izithelo ezidlekayo*	
2.9 Hunting/*ukuzingela*	
2.10 Recreation/camping/hiking/*ukungcebeleka/ukuhlala emaweni/ucaca izintaba*	
2.11 Research/bio-prospecting/ *ucwaningo/ukusetshenziswa kwezimila ukwakha imithi*	
2.12 Habitat for other species/*ikhaya lezinye izimila/nezilwane zasehlane*	
2.13 Biodiversity/*ukuphila ndawonye kwezimila zemnvelo*	
2.14 Carbon sequestration (removing carbon dioxide from the air)/*ukususwa komoya ongcolile (isikhutha) emkhathini*	
2.15 Soil conservation/*ukongiwa kanye nokunakekelwa kwenhlabathi*	
2.16 Water quality/izinga eliphezulu *lokuhlanzeka kwamanzi*	
2.17 Natural beauty/*ubuhle bemvelo*	
2.18 Sanctuary/solitude (A sacred place, such as for worship)	
2.19 Wildlife appreciation/*ukwaneliseka ngemvelo*	
2.20 Heritage/legacy (an inheritance)/*Amagugu*	
2.21 Burial sites/*izindawo zokungcwaba*	

3. Section C. Financial benefits

3.1 How long does it take you to get to the forests? (hrs) /*Kuthatha isikhathi esingakanani ukufinyelela ehlathini?*	
3.2 Do you sell any products from these forests? /*Ingabe niyayidayisa imikhiqizo yehlathi?* (0= No; 1=Yes) ***(NB: If No go to section 4)***	
3.3 If yes, what are these forestry products?/*Uma uthi yebo, yiyiphi leyo mikhiqizo***?(Rate them according to importance).**	
a) b)	
c) d)	
3.4 How many times per month do you visit the forest to collect the main product that you sell?/*kukangaki enyangeni ulanda imikhiqizo leyo oyidayisayo?*	
3.5 Where is the market for these products? *idayiswa kuphi nendawo ?* **(**1= local people; 2 = towns and cities; 3=both local and cities; 4 = international)	
3.6 Approximately, what is the total annual income range your household gets from selling these forests products?/*ngathekisa,inani lenzuzo eniyitholayo ngonyaka?* **(**1= 0-10K; 2 =10K- 30K**;** 3 = 30K-60K**; 4**= >60K); where K = R1000.	
3.7 Are there situations where you make a saving by using a commodity from these forests instead of buying in the shops?/*ingabe kukhona okusebenzisayo kulomkhiqizo ngenhloso yokonga kunokuthenga?* **(0= No; 1=Yes)**	
3.8 If yes name these commodities/ *uma uthi yebo,iyiphi leyo-mikhiqizo?* **a)**..	
b)	

4. Section D: Household dependency on forests/scarcity/alternative options/ Ukuncika kwempilo yamakhaya ehlathini/ukutnuleka/amanye amathuba angasetshenziswa

What are the main sources of your household income? Rank them according to how much they contribute or their importance. Also include the income ranges, where (1= 0-10k; 2 = 10k- 30k; 3 = 30k-60k; 4 = ≥60k). Where K = R1000.

Dependency on forest for income		
Activity	**Ranking**	**Income range**
4.1 Crop production/*umkhiqizo wezitshalo*		
4.2 Livestock rearing/*ukukhuliswa kwemfuyo*		
4.3 Forest resources/*izidingo zehlathi*		
4.4 Household enterprise/*ezamabhizinisi asekhaya*		
4.5 Informal employment/*amatoho*		
4.6 Formal employment /ukusebenza ngokugcwele		
4.7 Transfers/remittances (working children/relatives)/imali ethunyelwayo		
4.8 Social grants /*usizo lwezimali zikahulumeni*		
4.9 Pensions /*impesheni*		
4.10 Other (specify)…		

Dependence on forest for firewood/*Ukuncika ehlathini ukuthola okokubasa*	
4.11 Do you have electricity?/ ninawo ugesi? (0= No; 1=Yes)	
4.12 Does your household collect firewood from the forest?/*ingabe niyatheza?* (**0= No; 1=Yes)**	
4.13 If not, why?/*uma uthi cha,yinindaba?* (1= prohibited/*anivunyelwe*; 2= we have electricity/ *ninawo ugesi* ;3= get it from elsewhere/ *ninenye indlela yokuzithola*)	
4.14 If yes, how many head-loads of firewood does your household collect from these forests each week?*uma uthi yebo,nithwala izinyanda ezingaki ngeviki?*	

Dependence on forest for construction pole/*ukuncika ehlathini ukuthola izingodo zokwakha*	
4.15Do you use timber for constructing your houses? /Ingabe niyazisebenzisa izingodo umanakha izindlu? (0= No; 1=Yes)	
4.16 **If yes, where did you get the wood for constructing your house(s)?/uma uthi yebo,nizithathaphi izingodo?** (1 = from the forest/ehlathini; 2 = bought elsewhere/niyazithenga; 3 = elsewhere for free/nizithola mahhala kwenye indawo)	
4.17If you got them elsewhere, why didn't you get wood from this forest? / Uma nizithola mahhala kwenye indawo,yini ningazigawuli kuleli hlathi? **(**1= we are prohibited/anivunyelwe; 2 = no need/lutho; 3= buy elsewhere/nizithenga kwenye indawo; 4 = get it elsewhere for free/ nizithola mahhala kwenye indawo; 5 = the poles are poor quality/zisezingeni eliphansi lokwakha)	
*4.18***Do you use wooden poles to construct livestock pens?/Niyazisebenzisa yini izingodo ukwakha amahhoko kanye nezibaya?**(0= No; 1=Yes)	
4.19 **If yes, where did you get the wooden poles for constructing your livestock pens?** */Uma uthi yebo, nizithathaphi lezo zingodo?* (1 = from the forest/niyazigawula ; 2 = bought elsewhere; 3 = elsewhere for free	
4.20 If you got them elsewhere, why didn't you get them from the forest?(1= we are prohibited/anivunyelwe; 2 = no need/lutho)	
4.21 Have you ever used burial logs from the forest after the death of a family member/close relative? /*Uma kushoniwe wake wagawula izingodo zokubiyela ithuna?* **(0= No; 1=Yes)**	
4.22 If not, would you use them if a family member dies?/Uma uthi cha, ningazisebenzisa yini?(0= No; 1=Yes)	

4.23 What are the three main products you need from these forests? */Shono imikhiqizo emithathu oyidingayo kulamahlathi? (zithegwa kwenye indawo)*	**1……** **2……** **3.**
4.24 Apart from these forest, where else do you get these three main products?/*Ngaphandle kwalamahlathi zitholakalaphi?* **(**1 = no alternative/ndawo; 2 = buying from elsewhere/zithegwa kwenye indawo; 3 = get them elsewhere for free/ sizithola mahhala kwenye indawo**)**	

5. Section E: Household decision to participate in CBFM/ *Isinqumo somndeni sokuzimbanakanya kwezamahlathi*

Participation in forest management refers to household member involvement in any activities of forest management, as indicated in 5.1.

5.1 Are any members of your household currently involved in any of the following activities of the forest management/CBFM? /*Ingabe kukhona ilungu lomndeni elizimbandakanya nemisebenzi eyenzeka ehlathin?***(0= No; 1=Yes).**	
1 = Decision making process/planning e.g. meetings about forest (committee) /*isigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor; policing; planting; coppicing/ *ukusetshenzwa kwehlathi e.g abasebenzi hlathini, amaphoyisa etc*	
3 = Needs assessment e.g. meetings/discussions (committee)/*ukubalulwa kwezidingo/ukuthamela imihlangano*	
4= Resource mobilization (e.g. funds/cash; tools)/*ukuhlwaya uxhaso lwezimali*	
5= Monitoring and evaluation/*ukulandelela kanye nokubuyekeza*	
6= Any other/*chaza nokunye*..	
5.2 If yes to any of the above proceed with 5.3; if no, jump to 5.12*/mangabe uthe yebo ngenhla qhubeka no5.3 mangabe uthe cha,qhubeka ku5.12*	
5.3 If yes, which of the following forest management activities are they mainly involved in?/*mangabe uthe yebo, iyiphi imisebenzi yehlathi obambe iqhaza kuyona?* **(Rate those that apply according to the level of participation).**	
1 = Decision making process e.g. meetings about forest (committee) /*isigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor; policing; planting; coppicing/ *ukusetshenzwa kwehlathi e.g abasebenzi hlathini, amaphoyisa etc*	
3 = Needs assessment e.g. meetings/discussions (committee)/ *ukubalulwa kwezidingo/ukuthamela imihlangano*	
4 = Resource mobilization (e.g. funds/cash; tools)/*ukuhlwaya uxhaso lwezimali*	
5 = Monitoring and evaluation/*ukulandelela kanye nokubuyekeza*	
6 =Any other specify... *chaza nokunye…..*	
5.4 If yes to 5.1, what were the main incentives to join and participate in these activities? /*Mangabe uthe yebo ku5.1, yini edala ukuthi uzimbandakanye nemisebenzi eyenzeka ehlathini? (Rate those that apply according to order of importance)*.	
1= Financial benefits**;**/ *ukuhlomula ngokwezimali*	
2 = Livelihood values/subsistence benefits/*ukuhlomula ngokwenhlalakahle*	
3= Aesthetic values;/*ukubona ubuhle benvmelo*	
4 = Moral/spiritual values/*ukuba nendawo evuselela negcina' inkolo'*	
5= Any other (specify)… *chaza nokunye…..*	
5.5 Which of the following does your household contribute to the forest management/ CBFM? */Yiziphi izinto ikhaya lakho elisiza ngazo kwimisebenzi eyenzeka ehlathini ?***(Rate those that apply according to the level of contribution).**	
5.5.1 Cash/*Imali*	

5.5.2 Information/knowledge/*Ulwazi*	
5.5.3 Labor/*Ukusebenza ehlathini*	
5.5.3 Inputs/ tools/Implements/*Yizisetshenziswa/amathuluzi*	
5.5.4 Other (specify)…. *chaza nokunye*….	
5.6 If it contributes, how frequently per month does your household contribute*?/Mangabe umndeni wakho ubamba iqhaza,lisiza kangakanani ngenyanga* (1 = weekly; 2 = monthly; 3 = quarterly; 4 = every 6 months; 5 = yearly; 6= after more than 1 year)	
5.6.1 Cash/ *Imali*	
5.6.2 Information/knowledge/*Ulwazi*	
5.6.3 Labor/*Ukusebenza ehlathini*	
5.6.3 Inputs/ tools/Implements/*Yizisetshenziswa/amathuluzi*	
5.6.4 Other (specify)… *chaza nokunye*….	
5.7 Do you sometimes receive support to manage your forest? */Ingabe ngesinye isikhathi nithola usizo ekulungiseni ihlathi?* **(0= No; 1=Yes)**	
5.7 Who provides you with support in managing the forest?/ *Mangabe yebo,ubani onisizayo ekuphathweni kwehlathi?* **(List according to their contribution)**.... ……	
5.8 If yes in 5.7, what type of support do you receive? *Mangabe yebo yioluphi usizo enulutholayo?* **(List according to main type of support and also indicate how frequently you receive that support).**	Frequency
1.	
2.	
4. Other (specify)…	
5.9 Do you keep records about the forestry activities? /*Ingabe ikhona yini imininignwane ebhaliwe mayelana nokugcinwa kwehlathi?* **(0= No; 1=Yes)**	
5.10 If yes, who keeps them? (Specify*)…?/mangabe kukhona, ubani okugcinayo*	
5.11 If not, why do you not keep these records?/*Mangabe cha, kungani ningayigcini imininingwane?*	

*(This section applies to those who are **not participating and are willing to join** the forest management (CBFM)*

5.12 If not to 5.1, are you willing to join and participate in any of the following forest management activities/*Mangabe uthe cha ku5.1,ungathanda yini ukuzimbandakanya emisebenzini eyenzekayo yokuphathwa kweehlathini ?* **(0= No; 1=Yes)**	
1 = Decision making process e.g. meetings about forest (committee) /*usigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor; policing; planting; coppicing/ *ukusetshenzwa kwehlathi e.g abasebenzi hlathini, amaphoyisa etc*	
3 = Needs assessment e.g. meetings/discussions (committee)/ *ukubalulwa kwezidingoe.g. ukuthamela imihlangano*	
4 = Resource mobilization (e.g. funds/cash; tools)/*ukuhlwaya uxhaso lwezimali*	
5 = Monitoring and evaluation/ *ukulandelela kanye nokubuyekeza*	
6 =Any other specify*...chaza nokunye*…	
5.8 If, yes to any of the above, proceed with 5.13, if no to all of the above, go to 5.18*/mangabe uthe yebo ngenhla qhubeka no5.13,mangabe uthe chakuzo zonke lezi ezingenhla qhubeka uye ku5.18.*	
5.13 Why has your household not been participating in managing the forest all along?/*Yini indaba umndeni wakho ungazimbanakanyi (ukubamba iqhaza) nemisebenzi eyenzeka ehlathimi sonke lesikhathi* **(Rate them according to order of importance).**	
1= Were unaware of the forest management/ *bezingazi ngokuphathwa kwehlathi*	
2= Not sure of the benefits/*asazi kahle ngokuhlomulwa ehlathini*	

3= Worried about conflicts in forest management/*sikhathazwa yizinxushunxhushu ezikhona ngokuphathwa/nokulawulwa kwehlathi*	
4 = Worried about poor distribution of benefits/*sikhathazwa yindlela engafani yokwabiwa/nokuhlomula ehlathini*	
5 = Any other (specify)… chaza nokunye….	
5.14 Which of the following forest management activities would you want to participate in?/*kuloku okulandelayo; yimiphi imisebenzi yokuphatha/ukulawula ongabamba iqhaza kuyona ehlathini?* **(Rate them according to order of preference).**	
1 = Decision making process e.g. meetings about forest (committee)//*isigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor; policing; planting; coppicing/ *ukusetshenzwa kwehlathi e.g. abasebenzi hlathini, amaphoyisa etc*	
3 = Needs assessment e.g. meetings/discussions (committee)/ *ukubalulwa kwezidingo e.g. ukuthamela imihlangano*	
4 = Resource mobilization (e.g. funds/cash; tools)/ *ukuhlwaya uxhaso lwezimali*	
5 = Monitoring and evaluation/ *ukulandelela kanye nokubuyekeza*	
6 =Any other specify*...chaza nokunye...*	
5.15 Which of the following would you be willing to contribute?/*kuloku okulandelayo; yingabe yikuphi/yiliphi iqhaza ongalibamba*. **(Rate them according to order of preference).**	
1= Cash*;/ imali*	
2 = Information/*ulwazi*	
3 = Inputs/*insizakusebenza*	
4 = Tools/Implements/*Yizisetshenziswa/amathuluzi*	
5 = Labor/*ukusebenza ehlathini*	
6= Any other (specify)…*chaza nokunye…*	
5.16 How frequently per month would you be willing to meet and discuss matters related to the forest? /*Enyangeni ungathanda ukuhlangana kangakanani kukhulunywe ngendaba ezihlangane nezasehlathini?*	
5.17 What would you want to improve when you join the forest management/CBFM?/*Yini ongathanda ukukwenza ngcono, mangabe ubamba iqhaza ekulawuleni/nasekuphatheni kwehlathi.*	

*(This section applies to those who were **participating and have stopped**)*

5.18 Has any member of your household ever stopped participating in the following forest management activities after joining? */Ingabe kukhona ilungu lomndeni wakho eliyekile ukuzimbandakanya (ukubamba iqhaza) ekulawuleni/nasekuphatheni imisebenzi eyenzeka ehlathini?* **(1 = No; 2 = Yes)**.	
1 = Decision making process e.g. meetings about forest (committee) /*usigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor; policing; planting; coppicing/ *ukusetshenzwa kwehlathi e.g. abasebenzi hlathini, amaphoyisa etc*	
3 = Needs assessment e.g. meetings/discussions (committee) / *ukubalulwa kwezidingo e.g. ukuthamela imihlangano*	
4 = Resource mobilization (e.g. funds/cash; tools)/ *ukuhlwaya uxhaso lwezimali/nezinsiza*	
6 =Any other specify*...chaza nokunye...*	
5.19 If Yes to 5.18 proceed with 5.20, if no go to 5.25. */Mangabe uthe yebo,qhubeka uye ku5.20,mangabe uthe cha qhubeka uye ku5.25.*	
5.20 What was the main incentive for members of your household to participate in managing the forest before they stopped?/*Yini edale ukuthi ukuthi ilunga lomndeni lizimbandakanye (libambe iqhaza) ekulawulweni/nasekuphathweni kwehlathi ngaphambi kokuthi liyeke?* (Rate them according to order of importance)	
1= Financial benefits/*ukuhlomula ngokwezimali*	
2 = Livelihood values/subsistence benefits/ *ukuhlomula ngokwenhlalakahle*	

3= Aesthetic values/ *ukubona ubuhle benvmelo*	
4 = Moral/spiritual values/ *ukuba nendawo evuselela negcina' inkolo'*	
5 = Now aware of the benefits	
6=any other (specify)… *chaza nokunye*…..	
5.21 Why did the household member(s) stop participating in managing the forest? *Yiziphi izizathu ezenza ukuthi ilunga lomndeni liyeke ukuzimbandakanya ukuphatheni nasekulawulweni kwehlathi?* **(Rate them according to order of importance).**	
1= Unequal distribution of benefits/*ukungabiwa kwemihlomulo yehlathi ngokulingana*;	
2= Discrimination/*ubandlululo*	
3= CBFM conflicts/*izingcabano ezikhona ekubhekeleni ihlathi*	
4 = Better income opportunities elsewhere/*Amathuba nenkokhelo engcono kwezinye izindawo*	
5 = Any other (specify)…*chaza nokunye*…	
5.22 Which of the following forest management activities was your household member(s) participating in? *Kuloku okulandelayo; yikuphi lapho lunga lomndeni ebelizimbandakanya ekubambeni iqhaza ekulwawuleni kwehlathi?* (Rate them according to order of preference).	
1 = Decision making process (e.g. meetings about forest) /*usigcawu sokuthatha kwezinqumo e.g. emihlanganweni*	
2 = Implementation e.g. labor/ *ukusetshenzwa kwehlathi e.g. abasebenzi hlathini*,	
3 = Needs assessment (e.g. meetings)/ *ukubalulwa kwezidingo e.g. ukuthamela imihlangano*	
4 = Resource mobilization (e.g. funds/cash; tools)/ *ukuhlwaya uxhaso lwezimali/nezinsiza*	
5.23 Which of the following was your household contributing to the management of the forest?/ *Yini ilungu lekhaya lakho belukufaka kwimisebenzi yasehlathini* **? (Rate them according to order of preference).**	
1= Cash/*imali*;	
3 = Inputs/ *insizakusebenza*	
4 = Tools/Implements/ *Yizisetshenziswa/amathuluzi*	
5 = Labor/ *ukusebenza ehlathini*	
6= Any other (specify)… *chaza nokunye*…	
5.24 What would you want to improve/change if you were to join in forest management again? *Yini ongakwenza ngcono uma ungazimbandakanya nokuphathwa/nokulawulwa kwehlathi.*	

*(This section applies to those who are **not participating and are not willing** to join the CBFM)*

5.25 Why are members of your household not willing to join and participate in forest management? *Kungani amalunga omndeni wakho engazimbandakanyi/ukubamba iqhazaekulawulweni/nasekuphathweni lwehlathi?*

5.26 Do you as household head participate in forest management/CBFM? / *Ingabe wena njengenhloko yomuzi uyazimbandakanya ekulawulweni/nasekuphathweni/kwehlathi?* (1= No; 2 =Yes)	
5.27 If yes, what is your role in forest management/CBFM? *Mangabe uthe yebo, liyini iqhaza lakho ekulawulweni/nasekuphathweni kwehlathi?* (1= chairman; 2=secretary; 3=member; 4=other specify…	
5.28How much trust do you have on members of the CBFM/forest management team? *Ubathemba kangakanani amanye amalunga/ithimba elibhekele ukulawulwa/nokuphathwa kwehlathi?* (1= None; 2 = little trust; 3= trust them very much)	

5.29 How much trust do you have in the leaders of the CBFM/forest management? *Unethemba elingakanani kubaholi abalawula ihlathini?*(1= None; 2 = little trust 3= trust them very much)	
5.30 Do you trust that the benefits from the forest can be distributed equally and fairly? *Ingabe unalo ithemba lokuthi enikuhlomula ehlathini kwabiwa ngokulinganayo?* (1= No; 2 =Yes)	
5.31 Are there any problems being faced in managing this forest*? /Kungabe zikhona yini izinkinga enihlangabezana nazo ekuphathweni/ekulawulweni kwehlathi?* (0= Yes; 1= No; I don't know)	
5.32 If yes, what are the main problems? / *Uma-impendulo ithe yebo, yiziphi lezonginka?*	
a)	
b)	

6. Section F: Institutional factors

6.1 Who is in control of this forest in your area?/ *Ubani owaphethe lamahlathi kulendawo?* (1= State /*Uhulumeni*; 2 = Private/ *inkampani ezimele*; 3 = Chief /*Inkosi*; 4 = Community *umphakathi*; 5 = Open access/ *wonke umuntu unemvumo yokusebenzusa*; 6 = NGO/*enkampani engekho phansi kuka Hulumeni*; 7= Committee/ *ikomidi*)	
6.2 Is anyone forbidden from harvesting? /*Ukhona ongavunyelwa ukugeca amahlathi?* **(**1 = Yes; 2 = No; 3 = I don't know /*Angazi*)	
6.3 If yes, who is forbidden to harvest? /*Uma ekhona, ubani ongavunyelwe?* (1 = everyone *wonke umuntu*; 2= Non-participating groups /*abantu abangazibandakanyi*; 3= Non members of community /*abantu abangahlali kulomphakathi*; 4= other/*okunye* (specify)…	
6.4 Is there consistent monitoring of the forest?/ *Liyanakekelwa sonke isikhathi na ihlathi?* 1= Yes, there is regular monitoring (year round)/*yebo liyanakekelwa njalo* 2 = There is occasional monitoring (not year round)/ linakekelwa ngezinye izikhathi, 3= No monitoring at all; 4= I don't know? /*Angazi*	
***6.5* Is there consistent sanctioning/penalties for those who break forest rules? /** *zikhona na izijeziso kulabo abaphula imithetho yamahlathi?* 1= Yes, there is regular sanctioning (year round)./ *yebo zikhona njalo izijeziso* 2= There is occasional monitoring and sanctioning (not year round) */asikho isijeziso* 3= No sanctioning at all; 4= I don't know */angazi*	
6.6 What sanctioning/penalty methods are used? /*abaphula imithetho bajeziswa kanjani?*	
1= Verbal chastisement / *owephule umthetho uyexwayiswa ngomlomo*	
2= Forced public apology/ *uyaphoqwa ukuba axolise emphakathini*	
3= Fines/*ukhokha imali yenhlawulo*	
4= In-kind contributions of materials or labor/*uyaphoqwa ukuba asebenzele umphakathi*	
5= Restrictions on future harvesting/*uphuzwa imvume yokusebenzisa ihlathi*	
6= No penalties at all/*ayikho ayikho inhlawulo*	
7= any other (specify)/*uma kukhona okunye ungachaza*	
6.7 Are the rules governing the forest clear and easy to understand?/*Imithetho elawula ukusetshenziswa kwehlathi iyaziwa / icacile yini emphakathini?*(1 = Yes; 2 = No; 3 = I don't know /angazi).	
6.8 If not, in what way are they not clear?/ *Uma imithetho elawula ukuphathwa kwamahlathi ingaziwa emphakathini, ngabe yini eyenza ukuba ingazawa/ ingacaci?* **(**1 = Not aware that there are rules */asazi ukuthi ikhona ikithetho*; 2 = I am aware but they are not clearly defined/*ngiyazi ngemithetho, kodwa ayichaziwe ngokuphelele***;** 3 = Had never been explained to the people/ *imithetho ayikaze ichazelwe umphakathi*;4 = Any other/ *okunye ungachaza…*	
6.9 Does everyone follow the rules of the forest strictly? /Ngabe bonke abantu bayayilandela imithetho yokuphathwa kwehlathi? (1= No; 2 = Yes; 3 = I don't know/*Angazi*)	

6.10 If no, why not?/ *uma imithetho ingalandelwa ngabe kwenziwa yini?* **(**1 = poor enforcement of the rules /*imithetho ayiqinile*; 2 = no sanctioning/penalties are in place/ *ingoba ayikho inhlawulo uma umuntu ephule umthetho*; 3 = any other (*chaza*)…	
6.11 Who designed the rules?/ *ubani oshaya imithetho yokulawula amahlathi?* (1= locally by only a few/ *ishaywa ngabantu bathize abahlala lapha emphakathini*; 2= locally by the majority of community members /*ishaywa yiningi labahlali balapha emphakathini*; 3= externally by state/Chief/Induna)/*ishaywa uhulumeni/ inkosi,noma induna*	
6.12 **What rules about the forest do you dislike most? /** *Iyiphi imithetho elawula ukuphathwa kwehlathi ongayithandi?* **1……** **2……** **7**	

7. Section G cont..: Conflicts/misunderstandings

7.1 Are there conflicts being encountered in the management of the forest? /*Kukhona yini ukungezwani mayelana nokuphathwa kwehlathi?*(1= Yes; 2= No; 3 = I don't know)**.**	
7.2 If yes, what are the common causes?/*U**ma kukhona ukungezwani, ikuphi okuvamile?* (Rate them according to the most common cause) */(bala ngokubaluleka)*	
7.2.1 = Over appropriation of resources (setting aside for specific use) */ngokuhlelwa kwempahla ukuba isetshenziswelwe okuthile*	
7.2.2 = Over management issues/ *mayelana nokuphathwa kwehlathi*	
7.2.3 = Decision making */ukushaywa kwemithetho*	
7.2.4 = Harvesting/utilization of resources/ *ukusetshenziswa kwehlathi*	
7.2.5 = Unclear /conflicting policies/rules /*ukungacaci kwemithetho*,	
7.2.6 = Benefit sharing/ *ukkwabelana ngenzuzo*	
7.2.7 = Lack of trust/ *ukungathembani*	
7.2.8 = Any other *okunye (chaza)* …..	
7.3 Were any members of your household involved in the initial meeting(s) to plan about the forest?/ *Likhona yini ilunga lalaykhaya elake laba yingxenye yemihlangano yokuhlela kwezamahlathi* ? (1= Yes; 0 = No)	
7.5 Do you understand the whole plan of managing the forest?/*Uuyayiqonda kahle yini inqubo yokuphathwa kwehlathi?(*1= not at all /*cha angiyiqondi*; 2 = not so sure/ *anginaso isiqinisekiso*; 3= understand well /*ngiyayoqonda)*	
7.6 Are you happy with the forest committee in place?/ *Kuyakujabulisa inddlela ikomidi elenza ngayo?(*1 = unhappy/ *angijabule*; 2 = neutral /*anginankinga*; 3 = happy/ *ngijabule*; 4 = I don't care/ *anginandaba ngendlela abenza ngayo*	
7.7 If not, wh at are its main weaknesses/ *Uma ungajabule ngabe yini inking?* (1 = poor distribution of benefits /*inzuzo ayilingani*; 2 = inability to communicate/ *ukungaxhumani* ; 3 = discrimination/ *ukungaphathani ngendlela*; 4 = corruption/ ukukhohlakala)	
7.8 If you don't care, please can you give reasons?/*Uma ungenandaba ngokusebenza kwe komidi, ngabe kwenziwa yini? Sicela uchaze* **……** **……** **……**	

7.9 Which of the following options do you think is more important for these forests?/ *Khetha okubona kubalulekile ngokuphathwa kwamahlathi?* (1 = exploitation/ utilizing forest resources /*ukusebenzisa ihlathi*; 2 = forest preservation/ *ukonga ihlathi)*	
7.10 Who is not allowed to be part of forest managent?/ *Ubani ongavumelekile ukuba yingxenye yokuphathwa kwehlathi?* (1 = not at all /*akekho*; 2 = women/ *abasefazane*; 3= the very poor /*abahluphekile*; 4 = other tribes /*abangebona amaZulu*; 5 = Other chaza)…..	

8. Section H: Environmental awareness

Answer the following questions about forests and the environment in general. *(Allocate a point for each correct answerer in the table and any other correct answer provided by respondent)*

	Give a point for mentioning any of the following.	Score	Total
8.1 Name three bad consequences of deforestation?/ *Bala kube kuthathu okuyimiphumela emibi yokugawulwa khehlathi?*	***a) soil erosion****/ukugugulwa komhlabathi*		1
	b) loss of plant species*/ ukumbiwa kwezitshalo*		1
	c) pollution*/ ukungcola komhlaba,* ***d) global warming****/ ukufudumala*		1
8.2 How are trees important to the environment?/ *Kubaluleke ngani ukuba khona kwezihlahla amhlabeni?*	***a) prevention of soil erosion****/ zivikela ukuguguleka kwe nhlabathi*		1
	b) clean air c) wind guard*/ ihlanza umoya*		1
	d) conserving other species and habitats*/ zigcina eminye imithi, nezilwane*		1

9. Section I: Users' perceptions (Answer the following questions on forest protection and degradation).

9.1 Do you see any degradation of these forests?/ *Kukhona ukudicilela phansi kwamahlathi oke ukubone kule ndawo?* **(1= No; 2 = Yes).**	
9.2 If yes, who do you think is responsible for much of the forest degradation?/ *uma kukhona, ngabe ubani okwenzayo ukudicilela phansi ngabe ubani?* 1= local people mostly males/ *abantu besilisa*; 2 = local people mostly female /*abantu besifazane*; 3= Local elite mostly males; *abantu abaphethe balapha endaweni besilisa* ; 4 = local elite mostly females /*abantu abaphethe besifazane*; 5= male political leaders/ *abaholi bezeolitiki besilisa*; 6 = female political leaders /*abaholi bezepolitiki besifazane*; 7= Unknown intruders; 8 = any other (specify)…	
9.3 Are the mechanisms in place (rules and their enforcement) for protecting the forest sufficient?/*Iimithetho elawula ukuphathwa kwamahlathi yanele?* (1= No; 2 = Yes; I don't know)	
10.4If no, what else could be done? / *Uma inganele yini edinga ukulungiswa?* **….**	
9.5Who do you think should be responsible for protecting/conserving the forest resources? /*Ubani okufanele anakeke ukuphathwa kwehlathi?* 1= all local people/ *abantu bendawo*; 2 = local people mostly males/ *abantu besilisa*; 3 = local people mostly female/ *bantu besifazane*; 4= Local elite mostly males/ *abantu abaphethe besilisa*; 5 = local elite mostly females/ *abantu abaphethe besifazane*; 6 = male political leaders/*abantu bezepolitiki besilisa*; 7 = female political leaders/*abantubesifazane bezepolitiki*; 8 = Unknown intruders	

9.6 Who do you think should make the decisions about the forest? /*Ubani okufanele ashaye imithetho ngokuphathwa kwehlathi?* **(**1 = Govt /*uhulumeni*; 2 =NGOs/*izinkampani ezingo ngaphansi kuka hulumeni*; 3 = Local community /*umphakathi*; 4 = Chief/ inkosi; 5 = Any other/ okunye chaza…..……	
9.7 What fraction of the community is involved in the decision making process?/ *Bangakanani amalunga omphakathi ayingxenye yokuthathwa kwezinqumo?* (1= Only a few /*bancane*; 2 = Everyone /*wonke umuntu*; 3 = Majority of group/ *abantu abaningi*; 4 = I don't know /*angazi*)	
9.8Who is benefiting more from this forest??*Ubani ozuza kakhulu nganamhlathi?* (1= Only a few/ *abantu abancane*; 2 = Everyone/ *wonke unutu*; 3 = Majority of group/ *abantu abaningi*; 4 = I don't know /*angazi*)	
9.9 Who do you think should benefit more from the forest?/U*bani ocabanga ukuthi kufanele azuze kakhulu?* (1 = everyone/wonke umuntu; 2 = management/*abaphethe*; 3 = participants only *abazimbandakanya nokusebenza ehlathini*; 4= the poor /abahluphekile)	

10. Section J: Cultural/ethnicity/tribal diversity/homogeneity/ezamasiko nendabuko

10.1 Do these forests help your household in terms of cultural activities? /*Ingabe lamahlathi ayakusiza ekwenzeni usiko?* **(1= No; 2 =Yes)**	
10.2 If yes, how do they help your household in terms of cultural activities? /*uma uthi 'yebo', akusiza kanjani amahlathi kwezamasiko?* /**(Rate them according to order of importance)** *(hlukanisa ngokuthi ikuphi okubalulekile kakhulu)* **(1= No; 2 =Yes)**	
10.3.1 Burial sites/*indawo yokungcwaba*	
10.3.2 Traditional functions/ *imisebenzi yesintu*	
10.3.3 Spiritual/church purposes/*ukholo*	
10.3.4 Heritage/*Amagugu*	
10.3.4 Any other /*Okunye* (specify)...	

11. Section K. SCI-SLM General questions

11.1 Do you think the state of the forest has been improving or not over the last five years? /*Ucabanga ukuthi isimo sehlathi sithuthukile eminyakeni emihlanu edlule?* (1= improving/*sibe ngcono*; 2=not improving/*asibanga ncgono*; 3 = not changing/*asishintshanga* ; 4 = I don't know/*awazi*)	
11.2 If not improving, what could be the reason(s)? *Uma singashintshanga, ngabe yini imbangela?* **State**……..…….. …….…… …….……	
11.3 What could be the solution/what are your suggestions? /*Yini engaba isixazululo/noma yiziphi iziphakamiso zakho?* …….…… …….……..	
11.4 Do you think you have enough knowledge about management of this type of forest in your area? *Ucabanga ukuthi unalo yini ulwazi olunzulu ngokuphathwa kwamahlathi?* (0 = No; 1 = Yes)	
11.5 How many awareness meetings on forest conservation have you attended in the last five years? *Ikangaki lapho oseke wathamela umhlangano ngokuphathwa kwamahlathi/ukuqwashiswa ngamahlathi eminyakeni emihlanu edlule?*	

This section applies to respondents benefiting from natural forests

11.6 State which trees and plant species are preferred for the following forest functions? / *Chaza ukuthi yimiphi imithi yezihlahla ethandwa ukusetshenziswa kulokhu okulandelayo?***(Rank according to preference/***Hlukanisa ngokuthandwa kangcono).*

Forest functions	**Tree and plant species preferred/***izihlahla nezimila ezithandwayo*
11.6.1 Burial logs/*Izingodo zokungcwaba*	1…..…….. 2…..…….. 3
11.6.2 Firewood/*Izinkuni zokubasa*	1…..…….. 2…..…….. 3.
11.6..3 Construction houses/*Izingodo zokwakha*	1…..…….. 2…..…….. 3.
11.6.4 Construction cattle pens/*Ezokwenza izibaya zezinkomo*	1…..…….. 2…..…….. 3.
11.6.4 Traditional medicine/*Imithi yesintu yokwelapha*	1…..…….. 2…..…….. 3.
11.6.5 Craftwork/*Ukubaza nemisebenzi yezandla*	1…..…… 2…..…… 3.
11.6.6 Edible fruits/*Izithelo*	1…..…… 2…..…… 3.

11. 7 Aspirations of the community about their forest/ *Iziphi izifiso zomphakathi ngamahlathi*

11.7..1 What do you expect the community to achieve with regards to these forests? /*Ulindele ukuthi umphakathi wenzeni ngamahlathi?*
11.7.2 How best could this be done? / *Iyiphi indlela engcono yokwenzalokho?*

11.8 Any other information/*Enye imininingwane*

Please give us any other information not included above that you are interested to talk about in relation to the forest and their management in this area.
Sicela usinike okunye okungabhaliwe ngenhla obonayo ukuthi kubalulekile ngamahlathi nokuphathwa kwawo kulendawo.

Siyabonga kakhulu ngokuzinikela kwenu!!!!!!!!!!!!!!!!

Appendix 2: The results of PCA (Rotated matrix)

Rotated Component Matrix[a]

	Raw						Rescaled					
	Component						Component					
	1	2	3	4	5	6	1	2	3	4	5	6
Burial logs	-.014	-.014	-.015	.025	.016	-.021	-.044	-.043	-.048	.077	.049	-.066
Firewood	.238	.175	-.007	.046	.050	-.034	.425	.312	-.013	.083	.089	-.060
Construction poles	**.517**	.249	-.201	.069	.264	.016	.548	.264	-.213	.074	.280	.017
Electric poles	-.233	**.928**	.127	-.355	-.052	.148	-.197	.784	.108	-.300	-.044	.125
Craftwork	.264	**.819**	.123	.096	.251	.190	.231	.715	.107	.084	.220	.166
Traditional medicine	.272	.269	.090	.147	**1.345**	.044	.190	.188	.063	.103	.941	.031
Mushroom	.308	**.576**	-.084	.269	.154	-.001	.308	.576	-.084	.269	.154	-.001
Edible fruits	.383	.731	-.110	.153	-.010	-.083	.337	.643	-.097	.134	-.009	-.073
Hunting	.099	.210	.145	**1.151**	.073	.187	.078	.167	.115	.915	.058	.149
Recreation/camping/hiking	.486	-.042	.410	.376	.128	-.094	.462	-.040	.389	.357	.122	-.089
Research/bio-prospecting	**.591**	-.151	.251	.120	-.027	.009	.619	-.158	.263	.126	-.028	.009
Habit for species	**.529**	.161	.018	.171	-.057	.100	.604	.184	.020	.195	-.066	.115
Biodiversity	**.519**	.099	-.191	.080	.007	.101	.651	.124	-.239	.100	.009	.127
CO2 sequestration	**.659**	-.022	.402	-.094	-.166	-.063	.607	-.020	.371	-.087	-.153	-.058
Soil conservation	**.434**	.172	.037	-.064	.060	.050	.609	.241	.053	-.089	.085	.070
Water quality/ water quantity	**.645**	.058	.017	-.017	.104	.015	.748	.067	.019	-.020	.121	.017
Natural beauty	.372	.077	.065	-.007	.054	.031	.622	.129	.109	-.012	.090	.052
Sanctuary or solitude	.289	.108	.263	.178	.093	1.580	.174	.066	.159	.107	.056	.954
Wildlife appreciation	.426	.092	.053	-.021	.006	.125	.552	.119	.069	-.027	.008	.162
Heritage	.451	.104	.077	.093	.160	.045	.598	.137	.103	.124	.212	.059
Burial sites	.089	.064	**1.053**	.075	.063	.280	.074	.053	.877	.062	.052	.233

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Appendix 3: The results of OLS model to determine the anthropocentric values households attach to forest resources

```
. regress ANTHROPCNTRIC_VAL AGE GENDER HHOLD_SIZE MARITAL_STAT EMPLOYNY_STAT LEV
> EL_OF_EDUC  LEADERSHP_PST FARM_ACTIVITY EMPLOYD_MEMB DIST_TO_FOREST  SELL_FRST
> _PRDCTS ACCESS_TO_ELEC INCOM_AB_MEAN TOT_SOC_GRANT   ALTRNTIVE_SRCS  ENVIRONT_
> AWAR  CBFM_CONFLICT HH_PART_STAT NO_OF_HDLOADS

      Source |       SS       df       MS              Number of obs =     106
-------------+------------------------------           F( 19,    86) =    2.87
       Model |  25.1727387     19  1.32488098           Prob > F      =  0.0005
    Residual |  39.6506491     86  .461054059           R-squared     =  0.3883
-------------+------------------------------           Adj R-squared =  0.2532
       Total |  64.8233878    105  .617365598           Root MSE      =  .67901

------------------------------------------------------------------------------
ANTHROPCNT~L |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         AGE |  -.0005438   .0049341    -0.11   0.912    -.0103525     .0092649
      GENDER |   .3537836   .1827956     1.94   0.056     -.009602     .7171693
  HHOLD_SIZE |   .0170253   .0294567     0.58   0.565    -.0415326     .0755832
MARITAL_STAT |  -.1897343   .1767675    -1.07   0.286    -.5411365     .1616679
EMPLOYNY_S~T |   .0869744   .2533355     0.34   0.732    -.4166399     .5905888
LEVEL_OF_E~C |    .004342   .0237931     0.18   0.856     -.042957     .0516411
LEADERSHP_~T |   .6639297   .4431578     1.50   0.138    -.2170388     1.544898
FARM_ACTIV~Y |   .0402194   .2100195     0.19   0.849    -.3772856     .4577244
EMPLOYD_MEMB |   .0809999   .0982946     0.82   0.412    -.1144033     .2764032
DIST_TO_FO~T |  -.0140687   .0061888    -2.27   0.026    -.0263717    -.0017657
SELL_FRST_~S |   -.092913   .2547392    -0.36   0.716    -.5993178     .4134918
ACCESS_TO_~C |  -.1087361    .230729    -0.47   0.639    -.5674101     .3499379
INCOM_AB_M~N |   -.582789   .1966653    -2.96   0.004    -.9737466    -.1918313
TOT_SOC_GR~T |   5.35e-06   9.82e-06     0.54   0.588    -.0000142     .0000249
ALTRNTIVE_~S |   .3227715   .1842043     1.75   0.083    -.0434146     .6889575
ENVIRONT_A~R |   .1131218   .0505889     2.24   0.028     .0125544     .2136892
CBFM_CONFL~T |  -.2882068   .1230647    -2.34   0.021    -.5328514    -.0435622
HH_PART_STAT |  -.0650882   .1822483    -0.36   0.722    -.4273858     .2972094
NO_OF_HDLO~S |   .0894569   .0618687     1.45   0.152    -.0335341     .2124479
       _cons |   .0294517   .5098619     0.06   0.954    -.9841203     1.043024
------------------------------------------------------------------------------

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ANTHROPCNTRIC_VAL

         chi2(1)      =     1.91
         Prob > chi2  =   0.1672

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
ACCESS_TO_~C |      3.07    0.326076
LEVEL_OF_E~C |      2.78    0.360117
TOT_SOC_GR~T |      1.98    0.504015
  HHOLD_SIZE |      1.92    0.520437
         AGE |      1.84    0.543976
MARITAL_STAT |      1.67    0.598649
CBFM_CONFL~T |      1.62    0.616327
SELL_FRST_~S |      1.61    0.622348
INCOM_AB_M~N |      1.60    0.623534
EMPLOYNY_S~T |      1.58    0.634319
      GENDER |      1.50    0.668802
ALTRNTIVE_~S |      1.45    0.690390
FARM_ACTIV~Y |      1.43    0.698203
HH_PART_STAT |      1.41    0.708338
ENVIRONT_A~R |      1.35    0.739235
DIST_TO_FO~T |      1.30    0.772135
EMPLOYD_MEMB |      1.26    0.792183
NO_OF_HDLO~S |      1.26    0.796631
LEADERSHP_~T |      1.24    0.807004
-------------+----------------------
    Mean VIF |      1.68

.
```

Appendix 4: The results of OLS model to determine the cultural/moral/spiritual values households attach to forest resources

```
. regress CULTURAL_VAL AGE GENDER HHOLD_SIZE MARITAL_STAT EMPLOYNY_STAT LEVEL_OF
> _EDUC LEADERSHP_PSTN FARM_ACTIVITY EMPLOYD_MEMB DIST_TO_FOREST  ACCESS_TO_ELEC
>  INCOM_AB_MEAN TOT_SOC_GRANT ALTRNTIVE_SRCS ENVIRONT_AWAR CBFM_CONFLIC HH_PART
> _STAT  HARV_PROHIBB CULTR_BENEFITS FOREST_TYPE

      Source |       SS       df       MS              Number of obs =     149
-------------+------------------------------           F( 20,   128) =    2.92
       Model |  44.9808045     20  2.24904022           Prob > F      =  0.0001
    Residual |  98.6969744    128  .771070113           R-squared     =  0.3131
-------------+------------------------------           Adj R-squared =  0.2057
       Total |  143.677779    148  .970795804           Root MSE      =  .87811

------------------------------------------------------------------------------
CULTURAL_VAL |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         AGE |  -.0136888   .0053592    -2.55   0.012    -.0242929   -.0030847
      GENDER |  -.5256575   .1837386    -2.86   0.005    -.8892158   -.1620992
  HHOLD_SIZE |  -.0322052   .0291455    -1.10   0.271    -.0898745    .0254642
MARITAL_STAT |   .4305221   .1739167     2.48   0.015     .0863983    .7746459
EMPLOYNY_S~T |   .3349239   .2410766     1.39   0.167    -.1420873    .8119351
LEVEL_OF_E~C |   .0505691   .0234323     2.16   0.033     .0042042     .096934
LEADERSHP_~N |   .1309309   .2577084     0.51   0.612    -.3789893    .6408511
FARM_ACTIV~Y |   .1594427   .2465078     0.65   0.519    -.3283151    .6472004
EMPLOYD_MEMB |  -.0758184   .1025861    -0.74   0.461    -.2788026    .1271657
DIST_TO_FO~T |   .0035865   .0041101     0.87   0.385     -.004546     .011719
ACCESS_TO_~C |     .01931   .4329602     0.04   0.964    -.8373758    .8759958
INCOM_AB_M~N |   .4276351    .209336     2.04   0.043      .013428    .8418422
TOT_SOC_GR~T |   .0000105   .0000102     1.04   0.302    -9.58e-06    .0000306
ALTRNTIVE_~S |  -.4740135   .2200487    -2.15   0.033    -.9094175   -.0386095
ENVIRONT_A~R |   .0406329   .0488212     0.83   0.407    -.0559682    .1372341
CBFM_CONFLIC |   .0420167   .1575301     0.27   0.790    -.2696836     .353717
HH_PART_STAT |   .2331964   .1877811     1.24   0.217    -.1383606    .6047534
HARV_PROHIBB |  -.5338989   .1531231    -3.49   0.001    -.8368791   -.2309188
CULTR_BENE~S |   .0705914   .1845163     0.38   0.703    -.2945057    .4356885
 FOREST_TYPE |   .3951343   .4136477     0.96   0.341    -.4233384    1.213607
       _cons |   .7980753   .6211442     1.28   0.201    -.4309646    2.027115
------------------------------------------------------------------------------

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
ACCESS_TO_~C |      8.16    0.122568
 FOREST_TYPE |      7.54    0.132671
LEVEL_OF_E~C |      2.33    0.429005
         AGE |      1.93    0.518687
TOT_SOC_GR~T |      1.72    0.582487
  HHOLD_SIZE |      1.69    0.593272
INCOM_AB_M~N |      1.42    0.701776
MARITAL_STAT |      1.41    0.708724
FARM_ACTIV~Y |      1.41    0.710287
CULTR_BENE~S |      1.40    0.712016
EMPLOYNY_S~T |      1.40    0.712547
ALTRNTIVE_~S |      1.34    0.743618
HH_PART_STAT |      1.34    0.744270
      GENDER |      1.30    0.770673
DIST_TO_FO~T |      1.27    0.787562
ENVIRONT_A~R |      1.24    0.809562
EMPLOYD_MEMB |      1.22    0.820262
HARV_PROHIBB |      1.20    0.830754
CBFM_CONFLIC |      1.17    0.856405
LEADERSHP_~N |      1.13    0.882783
-------------+----------------------
    Mean VIF |      2.08

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of CULTURAL_VAL

         chi2(1)      =     8.46
         Prob > chi2  =   0.0036
```

Appendix 5: The results of OLS model to determine the option/non-use values households attach to forest resources

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. regress NON_USE_VAL AGE GENDER HHOLD_SIZE MARITAL_STAT EMPLOYNY_STAT LEVEL_OF_
> EDUC LEADERSHP_PST FARM_ACTIVITY EMPLOYD_MEMB DIST_TO_FOREST SEL_FRST_PRDS ACC
> ESS_TO_ELEC INCOM_AB_MEAN TOT_SOC_GRANT ALTRNTIVE_SRCS ENVIRONT_AWAR CBFM_CONF
> LIC HH_PART_STAT HARV_PROHIBB  FOREST_TYPE

      Source |       SS       df       MS              Number of obs =     148
-------------+------------------------------           F( 20,   127) =    2.27
       Model |  38.5890379     20   1.9294519           Prob > F      =  0.0032
    Residual |  107.785643    127  .848705849           R-squared     =  0.2636
-------------+------------------------------           Adj R-squared =  0.1477
       Total |  146.374681    147  .995746128           Root MSE      =  .92125

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 NON_USE_VAL |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         AGE |  -.0064234   .0056837    -1.13   0.261    -.0176704    .0048236
      GENDER |  -.4282078   .1962294    -2.18   0.031    -.8165105   -.0399052
  HHOLD_SIZE |   .0188834   .0306355     0.62   0.539    -.0417388    .0795055
MARITAL_STAT |   .4071568   .1831138     2.22   0.028     .0448076    .7695059
EMPLOYNY_S~T |  -.0773357   .2503683    -0.31   0.758    -.5727695     .418098
LEVEL_OF_E~C |  -.0194794   .0249192    -0.78   0.436    -.0687901    .0298312
LEADERSHP_~T |  -.1619348   .3236435    -0.50   0.618    -.8023668    .4784972
FARM_ACTIV~Y |  -.0146792   .2466337    -0.06   0.953    -.5027228    .4733645
EMPLOYD_MEMB |  -.0686742   .1090507    -0.63   0.530    -.2844658    .1471174
DIST_TO_FO~T |  -.0046228   .0042115    -1.10   0.274    -.0129566     .003711
SEL_FRST_P~S |   .2131745   .3223518     0.66   0.510    -.4247016    .8510507
ACCESS_TO_~C |  -.1863165   .4589794    -0.41   0.685    -1.094554    .7219209
INCOM_AB_M~N |   .2291354   .2301374     1.00   0.321     -.226265    .6845358
TOT_SOC_GR~T |  -8.98e-06   .0000109    -0.83   0.410    -.0000305    .0000125
ALTRNTIVE_~S |  -.4239089   .2223205    -1.91   0.059    -.8638411    .0160233
ENVIRONT_A~R |   .0238562   .0527628     0.45   0.652    -.0805519    .1282643
CBFM_CONFLIC |   -.124283   .1693391    -0.73   0.464    -.4593745    .2108084
HH_PART_STAT |  -.2502914   .1995852    -1.25   0.212    -.6452345    .1446517
HARV_PROHIBB |   .1873862   .1574895     1.19   0.236    -.1242571    .4990295
 FOREST_TYPE |   .1274119   .4446828     0.29   0.775     -.752535    1.007359
       _cons |   .6200774   .6665342     0.93   0.354    -.6988734    1.939028
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. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of NON_USE_VAL

         chi2(1)      =     8.64
         Prob > chi2  =   0.0033

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
ACCESS_TO_~C |      8.31    0.120350
 FOREST_TYPE |      7.91    0.126410
LEVEL_OF_E~C |      2.37    0.421568
         AGE |      1.90    0.525317
TOT_SOC_GR~T |      1.78    0.560886
SEL_FRST_P~S |      1.69    0.590662
  HHOLD_SIZE |      1.68    0.593701
INCOM_AB_M~N |      1.49    0.672366
FARM_ACTIV~Y |      1.40    0.716058
MARITAL_STAT |      1.40    0.716468
EMPLOYNY_S~T |      1.37    0.729139
HH_PART_STAT |      1.36    0.735524
      GENDER |      1.32    0.759056
ENVIRONT_A~R |      1.30    0.768969
ALTRNTIVE_~S |      1.29    0.777498
CBFM_CONFLIC |      1.24    0.803417
EMPLOYD_MEMB |      1.24    0.808773
DIST_TO_FO~T |      1.24    0.808961
HARV_PROHIBB |      1.17    0.851355
LEADERSHP_~T |      1.15    0.869694
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    Mean VIF |      2.13

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